



Police Research Series
Paper 117

The Nature and Extent of Construction Plant Theft

Alaster Smith
Ruth Walmsley

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First Published 1999

Policing and Reducing Crime Unit: Police Research Series

The Policing and Reducing Crime Unit (PRC Unit) was formed in 1998 as a result of the merger of the Police Research Group (PRG) and the Research and Statistics Directorate. The PRC Unit is now one part of the Research, Development and Statistics Directorate of the Home Office. The PRC Unit carries out and commissions research in the social and management sciences on policing and crime reduction.

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Research commissioned by PRG will appear as a PRC publication.

ISBN 1-84082-267-8

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Foreword

This paper presents the findings of a study on the theft of construction equipment. The work was carried out to support the Home Office Plant Theft Action Group in developing initiatives to combat the problem of plant theft.

The study revealed that in 1997 24,192 items of plant were stolen in England, Scotland and Wales, although England accounted for by far the largest proportion of thefts. Plant had a theft rate of 26 per 1,000, compared with only 18 per 1,000 for road going vehicles in the same period. Most of this stolen equipment has never been recovered.

The victims of plant theft can incur considerable costs. The study showed that even taking the depreciated costs of used equipment into account, plant worth an estimated £66¼ million was stolen during 1997. If other costs are accounted for, such as hiring and purchasing replacement equipment, increased insurance premiums and loss of business, then the true cost of this problem can be seen to be much larger.

If plant theft is to be effectively reduced, it will need to be tackled by a variety of groups. While the police clearly have a part to play in tackling this crime, manufacturers, owners and operators all have a critical role in improving the security of this equipment. This paper provides guidance on the roles which each of these parties can and must play in future years.

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September 1999*

Acknowledgements

This research has only been possible with the help and advice of a wide range of different individuals. I would like to thank the members of the Plant Theft Action Group, in particular DI Keith Brayne and PC John Penn, for sharing their expertise in the plant equipment industry and for support in developing the survey questionnaires. I would also like to thank The Equipment Register, Derbyshire, Northumbria, Greater Manchester and West Yorkshire Police for their advice and help in both phases of the survey carried out in this research. Without the assistance of these organisations the collection of data would have been an extremely difficult task.

The greatest thanks must go the respondents who took the time to return the detailed information requested in both stages of the survey, regarding the equipment they have lost and the circumstances surrounding its theft. Those in PRCU who read and commented on this report need also to be thanked for their input, notably Judy Youell for her assistance on the technical writing.

The Authors

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PRC Unit wishes to thank Professor Mike Maguire and the University of Wales Cardiff who acted as external assessor on this report.

Executive summary

Background

Plant theft was anecdotally estimated to cost the construction industry between £600 million and £1 billion during 1997. This problem is perceived to be getting worse. This is particularly serious given the low recovery rate of construction plant, estimated at between five and 10% (PSDB, 1998; TER, 1998). Neither the estimated costs, nor the suggestion of rising theft rates, however, can be substantiated empirically. The Policing and Reducing Crime Unit (PRCU) was asked by the Home Office Plant Theft Action Group to carry out research to address the risk, cost and nature of construction plant theft.

Equipment theft rates and cost

It was estimated in the current research that slightly fewer than one million items of construction equipment (914,608) were in use in 1997. Just over 24 thousand (24,192) of these were estimated as having been stolen. This means that 2.6% of the entire plant parc was stolen in one year, giving a theft risk of 26 per 1000 items. This compares with a theft risk of 18 per 1000 for all motor vehicles in 1997, suggesting that plant is relatively vulnerable to theft. The research indicated that the smaller the equipment the higher the risk of theft, possibly reflecting ease of movement.

It was estimated that the stolen plant had a value of £66¼ million. While this is considerably less than previous assessments, this relates only to the *depreciated cost of the equipment at the time of theft*. If costs such as hiring and replacement, loss of revenue and business and the improvement of security are included the figure would be considerably greater. Unfortunately, the data are not adequate to generate a reliable total cost figure. The seriousness of this cost is exacerbated by the low recovery rate. Only 9.8% of the stolen plant was reported to be recovered – 6.3% whole and 1.2% broken up (the remaining 2.3% did not indicate what condition their equipment was returned in).

Location of theft

The majority of the stolen plant was located in urban areas (industrial, residential and shopping) at the time of theft. Most equipment was taken from building and construction sites, or depots and company parking areas, but 15% of the equipment was reported stolen from the roadside.

Financial cost to victims

Of the respondents who owned the equipment stolen, 63% bought new and 30% hired replacement plant. Of those who had hired the stolen equipment, 82% hired

more and 15% reported buying replacement plant themselves. Only 6% of the sample reported being unable to replace the stolen plant. Those operators who could not afford to replace their equipment were predominantly in the agricultural sector. A little over a third of the respondents reported a loss of revenue or custom as a consequence of the theft. In addition to this, 16% reported a loss of output. Nearly two-thirds of the thefts became subject to insurance claims, after which one third reported a rise in their insurance premiums.

Plant security

Relatively few security devices were reported used and this – coupled with the low site security in many cases – may contribute to the scale of the problem. Less than two-thirds of the respondents to the survey reported recording the serial numbers on their equipment. Only 5% reported the use of covert security marking and none reported the etching of serial or registration numbers onto their equipment. Very few stated that they had used alarms or immobilisers. The most common method of security was the padlock and chain, yet only 22% of the respondents reported that their equipment was chained at the time of its theft.

Location security

When looking at building sites, one fifth (20%) of the respondents reported that there was no security available at the site from which their equipment was taken. While almost 40% reported some form of compound at the location, only 23% said that there was a locked gate. Locked gates appear to be inadequate as a sole security precaution, many locks being broken, or gates simply lifted while still locked. The security available at depots was generally better than that at building sites; 23% of the respondents using depots reported that CCTV was in operation, 27% that security lighting was in use, 23% that the premises were alarmed and a further 18% that security guards patrolled the site.

Summary of action points

For plant manufacturers

- Improve equipment security, especially on high risk equipment.
- Mark components.

For security device manufacturers

- Improve consumer awareness and use of after-market security devices, especially for high risk equipment.

For plant owners

- Keep good records of equipment.
- Install effective security for the equipment and the location at which it is kept.
- Target high-risk equipment.
- Be clear who is responsible for security of hired equipment.
- Provide security advice to users.

For plant operators

- Use plant security.
- Improve site security.

For the police

- Improve awareness of plant at risk.
- Tackle stolen goods markets.
- Improve the recording of plant theft.
- Development and use of a comprehensive database of plant theft.

For insurers

- Drive change in security consciousness in the construction industry.

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1. Introduction

Background

Construction equipment (commonly known as plant) is a common sight at building sites and road works. There are many types, for many purposes, including generators, excavators, forklifts, access platforms and mobile lights. The theft of this equipment seriously affects those who rely on it for their livelihood. The total annual cost of plant theft to the construction industry has been anecdotally estimated within the industry as being in excess of £600 million. The Construction Plant-hire Association (CPA) has suggested that in 1997 the figure was higher still, closer to £1 billion per year (Ridout and Smit, 1997), and that the industry is only starting to realise the scale of the problem.

The theft of plant is particularly serious as, once stolen, the equipment is often not recovered. Recovery rates of plant are believed to be around 10% (though work by The Equipment Register (TER) suggests that it may be as low as 5%), compared with 70% for all vehicles. Stolen cars are more likely to be recovered if they have been the focus of opportunist theft, for example, as a means of transport home (Nicholas, 1997). Construction plant, being highly specialised in purpose, is less likely to be subject to this kind of theft. The majority of thefts will be for resale (whole or parts) or actual use, and this means that recovery is less likely. As a result, plant is considered to be a bad insurance risk, and premiums and excesses have increased over recent years, with the result that much plant is self-insured or uninsured. The Association of British Insurers estimate that 50% of the UK plant fleet may be uninsured.

Plant is considered to be an easy target with a ready market (Purbrick, 1998). There is evidence that much equipment is stolen for export – though the market is currently depressed (Penn, 1998). A highly mobile workforce in the construction industry, and links with organised crime, seem to have exacerbated problems for the police (TER, 1998). The financial cost of theft is compounded by work delays, replacement costs and administrative costs also incurred. The reporting and recording of plant theft is not made easy by the diversity of the equipment, the lack of familiarity and specialist knowledge of the police, and the fact that much equipment is not insured.

The Plant Theft Action Group

The Plant Theft Action Group (PTAG) is a Home Office advisory group representing those parties with an interest in reducing plant theft. It was established in 1996 and includes members from the agricultural and construction industries including manufacturers, insurers, hirers, users, trade associations, the police and other law enforcement associations. The group addresses three areas of concern:

- The lack of security devices and marking provided by manufacturers;
- The lack of good practice guidance for owners, hirers and users of plant; and,
- The need to enhance police understanding of plant theft.

In 1997, the PTAG decided that the level of information available on the nature and extent of the problem was inadequate. A request was made to the Policing and Reducing Crime Unit (then the Police Research Group) to carry out research to address this issue. This work commenced in September 1997.

Research objectives

The aim of the research was formally stated as:

‘The empirical examination of the risk, cost and methods of plant theft’.

In order to address these issues systematically the work was split into two stages:

- The first aimed at establishing the amount of plant used (the total parc), how much was stolen and how much it cost. Theft risk was then to be calculated both for construction plant as a whole and for specific types of plant. This information, along with the costs, will enable better *targeting* of actions to protect construction plant.
- The second stage focused in more detail on reported thefts, examining the circumstances surrounding them. It aimed to identify the typical locations and times associated with equipment theft, the range of security measures available (and in use) and the costs of such activity to the companies experiencing it. This information will support clearer *identification of strategies* to address the problem.

Together, these two stages should provide key information enabling the identification of equipment requiring protection, the best methods of target hardening and other ways in which equipment may be better protected. This information will support PTAG in developing a strategic programme to reduce plant theft. The group will be working closely with the Vehicle Crime Reduction Action Team, which has been charged with achieving the five year vehicle crime reduction target of 30% set by the Home Secretary. The current work will establish the importance of plant theft, and indicate where the greatest gains are likely to be made.

Format of the report

The report is divided into five further sections:

- Section 2 outlines the methodology used in conducting the research
- Section 3 addresses the first research aim, looking at the risk and cost of plant theft.

- Section 4 addresses part of the second stage of the work, looking at who the victims are, what plant is stolen, where it was taken from and the effects of theft.
- Section 5 looks at the types of security equipment used (on both the equipment and the site) and changes in security use following theft.
- Section 6 outlines the major implications of the research findings and the recommendations arising from them.

2. Methodology

Problems with existing data sources

The theft of light commercial vehicles (LCVs) and heavy goods vehicles (HGVs) have been considered in recent Police Research Group research reports (Brown, 1995 and Brown and Saliba, 1998). Both of these studies were able to use recorded crime data. Collection of data on construction plant, however, poses a number of unique problems. While the theft of plant is known to be prevalent and extremely costly, it is difficult to establish accurate figures on either theft rates or the pool of equipment in use. The most complete database of stolen plant is held on the Police National Computer (PNC). However, the characteristics of plant and the structure of the database present difficulties when attempting to get information for research purposes.

The PNC is primarily an operational tool, and records are routinely deleted from the database once an item has been recovered. While the number of stolen items outstanding can be ascertained at any time, it is not possible to identify the total number stolen during a given period without considerable re-analysis of the data. The structure of the PNC produces additional problems for gaining accurate information on stolen plant. Details of equipment may be located in one of several places within the database depending upon its characteristics, how it is reported by the owner, and the interpretation of the police officer recording the theft. If the plant is registered for use on the road, it may be recorded as a 'vehicle'. If not, it will be recorded under the 'property' category, and may be allocated to 'trailer', 'engine' or 'plant' sub-categories depending upon the interpretation of the reporting officer.

It is recognised that reporting officers often do not fully understand the nature and range of plant, and problems can arise from the classifications or descriptions which they give. For example, the term 'JCB' is often used to describe any 'make' of backhoe loader, regardless of the manufacturer. Compounding these problems is the fact that many losses are thought to go unreported. There are various reasons for this, including the equipment value being lower than the insurance excess, repeat losses, low recovery rates, and a perceived lack of interest from the police.

The Equipment Register (TER) and the National Plant Register (NPR) are voluntary registers which have merged to form the National Plant and Equipment Register. This register holds information on both plant owned and plant reported stolen by member companies. This appears to offer an extremely comprehensive source of information, but it is limited at present by the number of companies who register ownership and/or losses. Although many companies do register their assets and losses, there are a large number who do not. The information held, therefore,

will represent only a partial picture of total plant ownership and theft. In addition to the problems associated with these potential data sources, there is no mandatory requirement to register vehicular plant with the DVLA if it is not driven on public roads. As a consequence, only a small proportion of plant equipment will be registered in this way. For these reasons, it was determined that primary data collection would be required for this research rather than relying on pre-existing data.

The current approach

It was agreed that the plant users themselves should be approached and asked about the nature and scale of the problem directly. The focus was on plant *users* rather than *owners* because many of those who actually operate equipment hire or lease it rather than purchase it themselves. Postal surveys were designed to maximise the number of people who could be contacted in the time-scale available. Phase 1 of the study was aimed at all people who might use this equipment, asking what and how much they owned or used, how much it was worth and whether any was stolen in 1997. The second phase of the study focused on those who had had plant stolen, asking them about the circumstances surrounding the theft and its consequences for them. Before the surveys could be distributed, it was necessary to determine exactly what was being considered under the term 'plant'. The following section outlines some common definitions, and that developed for the current research.

Definition of construction plant

'Plant' is a catch-all term covering equipment designed for many different purposes in the construction, agriculture, forestry and other industries. It covers an extremely broad range of equipment from hand-held appliances such as drills and saws, through to large vehicles capable of moving many tons of material. It was not possible to specify an exhaustive list of the equipment to be included. Initial consideration was given to including plant on the basis of its market value. An arbitrary cut-off cost of £3500 was first proposed, to exclude smaller equipment. This method was felt, though, to be impractical as such equipment is frequently hired and users may not be aware of its true value. It was agreed with PTAG that the most effective method would be to broadly specify the types of plant being considered. The list developed contained 41 specified types of plant (see appendix A), focusing on mobile and self-propelled construction equipment, but left room for other types of equipment to be reported if the owner/user considered it appropriate. The definition for this research does *not* include small and hand-held equipment, and is defined as:

'construction equipment which is able to move under its own power, or which requires towing or attachment to another vehicle to be used'.

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This definition is similar to that suggested by the Greater Manchester Police and National Vulcan in their plant guide, which states that plant is:

‘an item of machinery, that is not purely hand-held, used in agricultural, engineering or construction industries, including attachments which cannot be moved without the use of a mechanical device or vehicle’.

Phase 1: Surveying plant users

The aim of this stage of the work was to gain an estimate of the amount of plant operated (used rather than owned), and how much was stolen. This information could then be used to calculate the relative risk of theft for:

- all plant, to enable comparison against other types of vehicle; and,
- specific types of plant, to enable targeting of the most vulnerable equipment.

It was decided to focus on companies in industrial sectors likely to operate plant. The first issue to resolve was how to identify them. The Office for National Statistics (ONS) holds a database called the Inter-Departmental Business Register (IDBR). This contains details of all VAT-registered enterprises in the UK. There

Government Office Region	Counties
South East	East Sussex, Surrey, West Sussex, Kent, Berkshire, Buckinghamshire, Oxfordshire, Hampshire, Isle of Wight
South West	Avon, Gloucester, Wiltshire, Dorset, Somerset, Cornwall, Devon
North East	Northumberland, Tyne and Wear, Cleveland, Durham
North West	Cumbria, Lancashire, Greater Manchester, Cheshire
East Midlands	Derbyshire, Nottinghamshire, Leicestershire, Northamptonshire, Lincolnshire
West Midlands	West Midlands, Shropshire, Staffordshire, Hereford and Worcester, Warwickshire
London	Greater London
Yorkshire and Humberside	South Yorkshire, West Yorkshire, North Yorkshire, Humberside
Eastern	East Anglia, Essex, Bedfordshire, Hertfordshire
Merseyside	Merseyside
Wales	Wales
Scotland	Scotland

are a number of small companies who are not registered and will therefore not be included in the current work. While this represents a potential bias in the sample, it will only exclude the very smallest companies who are least likely to have the larger and more expensive type of equipment of primary interest in the current research. The IDBR can be broken down according to region, enterprise size (in terms of annual turnover) and industrial sector. The regions used by the ONS can be seen in table 1. These were all selected with the exception of Northern Ireland. The population used in the survey thus draws upon companies registered in England, Wales and Scotland.

The IDBR also indicates the size of a company in terms of its annual turnover. Turnover can be categorised in various bands, though only three were used for the purposes of the current analysis – distinguishing between small, medium and large companies. These bands are shown in table 2.

Table 2: Company size and turnover bands

Company Size	Turnover Band (£s)
Small	1 – 99,000
Medium	100 – 999,000
Large	1,000,000 +

Selection of the industrial types to be contacted represented the most difficulty. The IDBR covers companies in all sectors, but only those likely to use plant were considered in the current research. General categories representing the construction industry in its widest sense were selected, as were most areas of the agricultural and forestry industries. Mining and quarrying makes use of much large equipment, and utility companies also need to be able to excavate and shift earth. Less obviously, warehousing, storage and distribution companies use plant such as forklifts and telescopic handlers.

Manufacturing companies may use some plant in order to handle and move their products. These companies were not included in the current research, however. It was the opinion of the PTAG that the range of plant operated by manufacturing companies would be small. Further, many companies, particularly small ones, would not operate plant. Given the low response expected and the limited range of information anticipated, it was decided to focus on those sectors for which the theft of plant is known to pose a considerable threat. Table 3 indicates the IDBR industrial sectors included in the survey population.

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Table 3: IDBR industrial sectors surveyed

Agriculture	Crops
	Forestry
	Animals
Extraction	Mining
	Quarrying
Utilities	Electricity
	Gas
	Water
Construction	Civil engineering
	General construction
	Special projects
	Drilling
	Demolition
Transport	Cargo handling
	Storage and warehousing
	Telecommunications
Local Authority	Works departments

Having identified the industrial sectors, region and turnover bands desired, the ONS were asked to provide contact details for 4000 enterprises. These were to be selected at random, but represent the full spectrum of region, size and sector. This sample was drawn from a population of 215,321 companies registered in the IDBR. The IDBR is split into 'proven' and 'unproven units'. Proven units are those companies whose taxation details have been confirmed, unproven are those who have registered their details but which have not yet been checked. The sample provided was drawn from the proven units, but the unproven units were also used in calculating estimated overall plant-loss figures.

Questionnaires were sent to each of the 4000 enterprises selected, asking about the types of plant they operate (own, hire or lease), and how much of that was stolen during the calendar year 1997. Each questionnaire was given a unique identification number so that the responses could be identified according to the region, industrial sector and size band the company fell into (216 discrete

categories). Of these 4000, 1868 questionnaires were returned after one reminder. This represents a 46.7% response rate, which is considered an acceptable response for a postal survey. However, not all of these questionnaires detailed plant losses. As the companies were drawn at random from a population identified as *likely* to use plant, a number responded that they did not. This was the case in 678 cases, leaving 1190 questionnaires from respondents who used plant. This meant that 36% of the sample did not operate the types of plant under consideration. This would need to be accounted for in any analysis of the data. Table 4 below shows the types of company included, but for whom the issue of plant theft was found irrelevant.

Table 4: Industries reporting they did not operate plant

Nurseries	Kennels
Interior designers	Fitters
Landscape architects	Gardeners
Social services	Local Authority (non-works departments)
Property developers	Couriers
Transport logistics companies	Haulage
Engineering consultants	Management consultants
Roofing insulation companies	

In order to derive estimates of the scale of the problem nationally from this survey it was necessary to take into account:

1. the proportion of returned questionnaires reporting the use of plant;
2. the proportion of the sample represented by the returned questionnaires, and;
3. the proportion of the total population represented by the sample.

These ‘weighting factors’ were calculated for users/companies in each combination of region, company size and industrial sector. The results can be seen in the next section (section 3). As there were too many companies to allow surveying of the entire population, and the response to the sample was incomplete (giving a self-selection bias to the data returned) the figures calculated can still only be treated as *best estimates*. They do represent an improvement over previous estimates however, having a sound empirical basis.

Phase 2: Surveying victims of theft

The second stage of the research focused on the characteristics of thefts, and was a questionnaire survey of victims, identified from police records and The Equipment Register. These questionnaires were only sent to people reporting the theft of equipment during the calendar year of 1997.

Four police forces (Derbyshire, Greater Manchester, Northumbria and West Yorkshire) and both The Equipment Register and the National Plant Register were asked to provide information about stolen equipment of the types listed (see appendix A). For each loss reported during 1997, they were asked to provide the type (and manufacturer where possible) of the equipment and the name and contact address of the owner (or person reporting the theft if different). All parties involved were extremely helpful, and provided much useful information. In total, 829 individual items of stolen equipment were identified, and questionnaires sent to the contact names provided. Of these, 255 were returned following one reminder letter. This represents 31% of the sample, and although lower than the response rate of the first phase, is still a good response for a postal survey. The results of this stage of the research are discussed in sections 4 and 5. As outlined above, self-report bias and the need to select a sample rather than use the total population means that the figures calculated represent a best estimate rather than a definitive guide.

Figure 1: Example of a telescopic handler



(Photograph courtesy of Caterpillar and Finning (UK) Ltd)

3. The risk and cost of plant theft

This section overviews the results of the first phase of the research – assessing the scale and cost of plant theft.

Equipment theft rates

The plant focused on in this research was split into three groups; large driven, small driven and non-driven plant. All the figures discussed in this section are derived by applying the weighting factors discussed in section 2 to the data provided in the questionnaires. Caution must be exercised when drawing implications from the estimated figures, as in many cases they are based on relatively small numbers of actual plant reported. The size of the weighing factors varies considerably depending on the region/turnover/industry category concerned. Having said that, these figures do represent the first systematic attempt to address the scale of the plant theft problem.

The research indicated that the risk of theft generally fell with increasing equipment size and cost. Thus, the largest equipment appeared to have the highest cost but the lowest number and risk of theft (expressed in thefts per 1000 items in use). The non-driven equipment was generally the lowest in cost, but had the highest number stolen and the highest risk of theft. This observation is likely to reflect the increasing logistical difficulty of stealing larger equipment. The overall figures calculated suggest that a little fewer than one million items of mobile plant (914,608) were in use within the construction, utility and agriculture industries in 1997. Of these, just over 24 thousand (24,191) were stolen. This suggests that 2.6% of the entire plant parc was reported stolen in one year, yielding a risk rate for theft for all plant of 26 per 1000 items of equipment in use. This is very high when compared with the rates for other vehicle types. In 1997 the risk of theft for all motor vehicles was 18 per 1000 (this includes cars, LCVs, HGVs, motorcycles and plant registered for use on the road). As a further comparison, the risk of theft for cars in 1996 was 16 per 1000, for LCVs it was 19 per 1000 and for HGVs it was only 7 per 1000.

Table 5: Estimated overall risk and cost of plant theft

Type of Plant	Number Owned	Number Stolen	Theft Risk (per 1000)	Total value of stolen plant
Large	454929	2811	6	£17,348,791
Small	160394	3516	22	£18,403,136
Non-Driven	299286	17864	60	£30,465,933
TOTAL	914608	24191	26	£66,217,860

From the data collected it is estimated that the equipment stolen throughout 1997 was worth a total of £66¼ million *at the time of theft*. This figure covers large, small and non-driven plant. Table 5 shows a summary of the costs and risks associated with these types of equipment.

This estimated cost is itself a considerable sum. It is small, however, when compared with the total cost to society of dealing with the stolen equipment. There are many other costs associated with the theft of this equipment, from police and insurance processing and investigation to owner and operator inconvenience, equipment replacement and business loss. Although the anecdotal estimate of £600 million reported in section 1 cannot be substantiated by the current work, if a total cost could be calculated it would be expected to be closer to this figure than the equipment costs alone suggest. Fuller data on the range of costs would be required to do this but could not be sufficiently developed in the current research, as will be discussed in section 5. The tables below show the estimated total figures for ownership, loss and cost of more specific items of equipment used in England, Wales and Scotland during the calendar year 1997.

Large mobile plant

Turning first to large driven plant, table 6 shows the estimated figures for ownership, theft and cost in Great Britain. These figures have all been calculated from the questionnaire data returned, using the weighting factors discussed in the previous section.

The 'other' category can be seen to contain plant with the highest estimated risk of theft (27 items being stolen per 1000 in use). This category includes equipment not covered by any of the pre-specified types. It covers a wide range of equipment from both construction and agricultural industries. The large agricultural equipment includes combine harvesters, forage harvesters, timber harvesters and chipping spreaders. However, despite representing 20% of all 'other' plant, none of it was reported stolen. 'Other' large construction plant includes screw levellers, straddle carriers, loading shovels, screeds, screens, bitumen and water sprayers, side loaders, vibratory ploughs, drilling rigs and landfill compactors.

In addition to having the highest risk of theft, 'other' large plant also has the highest frequency of theft, with just less than 2000 items estimated stolen in 1997. This equipment has a resale value of a little under £8¼ million. Comparing this with backhoe loaders, the next most frequently stolen type of large plant, only 11 per 1000 are stolen. It was estimated that 351 such loaders were taken in 1997, having a value of £4,945,873 at the time of theft. Large rollers and compactors

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were the next most likely to be stolen, followed by tractors, excavators, forklifts and dump trucks. A range of large plant was not reported stolen by any of the survey participants. This equipment includes loaders (excluding backhoes), bulldozers, trenchers, graders, scrapers, road planers, asphalt pavers, telescopic handlers, large self-propelled access platforms and cranes. It cannot be concluded that this equipment is never stolen, simply that none of the survey respondents had lost any of these items in 1997.

Table 6: Estimated large driven plant use and theft in GB

	Number Owned	Number Stolen	Theft Risk (per 1000)	Total value of stolen plant
'Other'	74256	1999	27	£8,235,960
Backhoe Loader	32527	351	11	£4,945,873
Roller/Compactor	10995	99	9	£618,403
Tractor	163606	254	2	£1,144,575
Forklift	19040	16	1	£98,102
Excavator 360	49750	71	1	£2,140,388
Dump Truck	38774	21	1	£165,490
Telescopic Handler	16832	0	0	–
Access Platform	7213	0	0	–
Crane	10527	0	0	–
Loader	14294	0	0	–
Bulldozer	7033	0	0	–
Trencher	2701	0	0	–
Grader	1596	0	0	–
Scraper	2674	0	0	–
Road Planer	1208	0	0	–
Asphalt Paver	1904	0	0	–
TOTAL	454929	2811	6	£17,348,791

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Small mobile plant

Table 7 below shows ownership, theft, risk and cost figures for smaller mobile plant.

	Number Owned	Number Stolen	Theft Risk (per 1000)	Total value of stolen plant
'Other'	14057	2254	160	£2,413,549
Mini Excavator	39308	929	24	£13,507,579
Loader	1582	34	22	£445,710
Roller/Compactor	16951	139	8	£996,548
Site dumper	52073	161	3	£1,039,750
Backhoe Loader	4012	0	0	–
Skidsteer Loader	7492	0	0	–
Trencher	361	0	0	–
Forklift	18324	0	0	–
Access Platform	6233	0	0	–
TOTAL	160394	3516	22	£18,403,136

As with large plant, the small 'other' category contains plant with the highest risk of theft (160 per 1000 in this case). As before, the 'other' category includes plant reported stolen that was not included on the specified list. In this case 64% was agricultural in nature and a proportion *was* stolen. This includes quad bikes, mini-tractors, stump-grinders, and specialised off-road vehicles. Quad bikes seem to represent the bulk of the losses but more data would be required to be certain of this. Other plant in this category includes sweepers, small mobile cranes and remote controlled demolition machines.

Following this equipment, mini-excavators appear to have the next highest risk of theft, with a theft rate of 24 per 1000. Mini-excavators were found to represent the largest contribution to the total estimated cost of plant theft, with 929 calculated to have been stolen in 1997, having a resale value of some £13½ million. Following mini-excavators, small loaders seem to have the next highest risk of theft at 22 per 1000, but the research suggests that the circulation and number of thefts are lower (only 34 were estimated stolen in 1997). Small rollers and site dumpers follow these in risk of theft. Small plant for which there were no reported losses include backhoe loaders, skidsteer loaders, trenchers, forklifts and self-propelled access

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platforms. As discussed with large plant, this does not mean that such plant is never stolen but that none of those in the sample experienced such theft.

Non-driven plant

Table 8, below, shows the same types of information for non-driven equipment. This equipment generally appears to be much more at risk of theft than self-propelled, or driven, plant.

	Number Owned	Number Stolen	Theft Risk (per 1000)	Total value of stolen plant
Cutter/Shearer	11240	1844	164	£1,155,269
Generator	12926	1935	150	£3,935,253
Drilling Equip.	12211	1174	96	£1,170,511
Temp. Traffic Lights	6417	563	88	£455,500
Other	61159	4980	82	£7,641,541
Access Platform	2214	146	66	£219,267
Breaker/Rd Hammer	61555	3895	63	£7,511,874
Roller/Compactor	31139	1399	45	£2,711,183
Compressor	33457	823	25	£4,271,857
Welding	34674	830	24	£527,811
Pump	10471	196	19	£544,077
Conveyor	5108	49	10	£247,654
Lighting Tower	5214	30	6	£74,136
Crusher/pulverizer	3088	0	0	–
Grab/Grapple	5784	0	0	–
Piling equip.	1912	0	0	–
Chip/Grit	717	0	0	–
TOTAL	299286	17864	60	£30,465,933

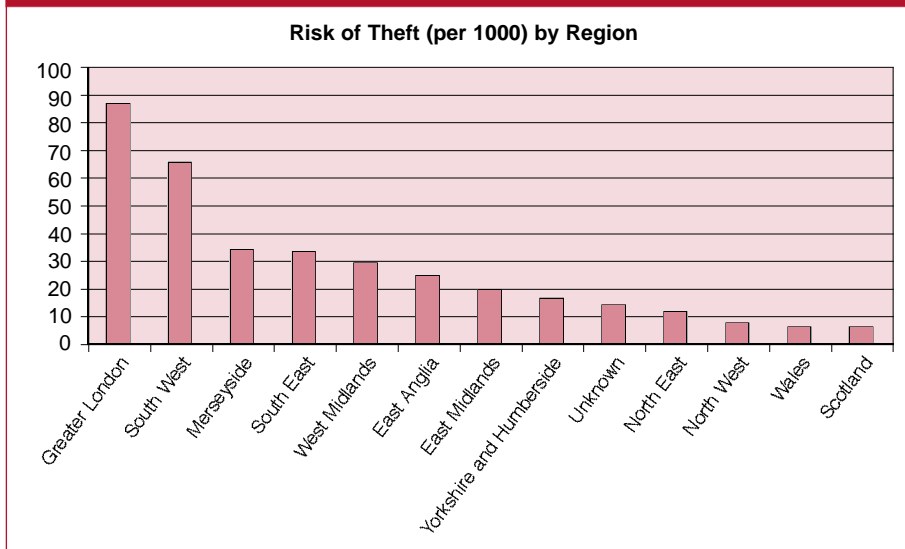
Non-driven equipment is usually smaller than self-propelled equipment, and has a higher risk of theft. This possibly reflects the relative ease of its removal. Cutters and shearers have the highest risk of theft (164 stolen per 1000), closely followed by generators (150 stolen per 1000). Drilling equipment and temporary traffic lights

also have a high rate of theft, at 96 and 88 per 1000 in use respectively. These are followed by ‘other’ non-driven equipment, which includes screens, grinders, balers, pressure washers, angle grinders, bowsers, chippers, and corn drying equipment. Agricultural equipment appears to make up 24% of ‘other’ non-driven equipment but, like large plant, does not seem to make up any of the losses. Trailer mounted access platforms and breakers/road hammers both have risks of theft of over 60 per 1000 in use.

Regional theft figures

Figure 2, below, shows the relative risks of theft in the various regions of England, Scotland and Wales. It appears that the theft rates vary considerably between the different regions, the rates in Wales and Scotland being lower than those of the English regions.

Figure 2: Risk of theft in different geographical regions



Greater London has the highest estimated rate of theft at 87 items per 1000 in use. Given the amount of development, of both buildings and infrastructure, this is perhaps not surprising. What is more unexpected is the fact that the South West appears to have the next highest risk of theft (65 items per 1000). The high figure in the South West appears to be due to high rates of generator and all types of ‘other’ plant theft. It is not clear why this differential pattern in theft risk occurs,

although the data does suggest that it may be attributable to losses suffered by the agricultural industry in the South West.

Merseyside and the South East have the next highest estimated rates of theft, though only about half that of the South West (34 items per 1000 in both areas). Generally, the south appears to have a higher rate of theft than the north. Scotland and Wales have the lowest rates of plant theft, each having a rate of only 7 per 1000 items in use.

Overviewing plant theft

Overall, the rate of theft is higher than for cars, but some types of plant have very high rates indeed. The picture that emerges is one of theft being focused on smaller, non-driven, plant, which seems to be particularly vulnerable. Larger plant is much less at risk generally, with theft spread across a range of differing types. This information may be used as a basis to develop a targeted response to plant theft which might be expected to produce the greatest gains in the shortest time span using the minimum of resources.

4. The nature and effects of plant theft

The next two sections will outline the findings from phase 2 of the research, looking at the nature of reported plant thefts. This stage of the work focused only upon *people who had reported losses to the police* (as described earlier in section 2). They were asked about the nature of the equipment, the location from which it was taken, the type of security available and the impact of the theft. This section will examine aspects of the thefts and their impact, while section 5 will cover the nature and extent of the security equipment in use.

Victims of plant theft

The majority of victims who reported the theft of their plant (70%) were from the construction industry. Other victims include the agriculture and forestry industries, utility organisations, transport-storage-communication firms and local authorities. Table 9 shows the percentages of the respondents in each category. No mining and quarrying companies reported losing equipment. A number of companies did not fit any of these categories and were coded as ‘other’; they include plant-hire organisations, fencing firms and textile manufacturing businesses. The plant-hire industry appears to be under-represented in this sample because the thefts were reported largely by the *user* rather than the owner. More than half (57%) reported owning the plant that was stolen, but 42% said that they had hired the equipment. Very little of the equipment reported stolen had been leased or acquired in any other manner. The proportion of people hiring equipment will have implications for theft prevention, as will be discussed.

Industrial sector	Percentage
Construction	69.8
Other	14.5
Electricity, Gas & Water Supply	8.6
Local Authority	3.5
Agriculture & Forestry	2.0
Transport, Storage & Communication	1.2
Mining & Quarrying	0.0

Types of plant stolen

The types of plant reported stolen cover a range of equipment (see table 10). The most frequent types of equipment reported were generators, breakers, road

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hammers, compressors and compactors. While many types of plant were not represented, a significant proportion of the most frequently stolen equipment (identified in the previous section) was included. The types and frequencies of equipment reported here reflect the nature of the plant theft problem, with greater emphasis on small, easily moved, equipment.

Table 10: Types of plant reported stolen

Type of Plant	Number Stolen	Percentage
Generator	52	20.4
Breaker/Road Hammer	48	18.8
Compressor	41	16.1
Roller/Compactor	38	14.9
Cutter/Sheerer	25	9.8
Excavator (360)	10	3.9
Large Backhoe Loader	8	3.1
Mini Excavator	6	2.1
Water Pump/Bowser	6	2.4
Dump Truck	5	2.0
Lighting Tower	2	0.8
Tractor	2	0.8
Auger	1	0.4
Drilling/Boring	1	0.4
Small Forklift	1	0.4
Temporary Traffic Lights	1	0.4
Welding Equipment	1	0.4

Make of plant

Considering stolen plant *overall*, no manufacturers' equipment appears to be targeted more than that of any other. The most common makes generally targeted appear to be JCB, Honda, Ingersol Rand and Caterpillar. JCB and Honda each accounted for 6% of the stolen equipment, Ingersol Rand 5% and Caterpillar 2%. These proportions may reflect market share, but without further information this cannot be examined. Looking at particular types of plant, differences in manufacturers *are* observed. It is still not clear, however, whether this reflects the

particular market shares of these manufacturers or a genuine preference for certain makes on the part of the thieves.

The most commonly targeted *excavators, large backhoe loaders, breakers and mini-excavators* appear to be manufactured by JCB. They made half of the excavators, over a third of large backhoe loaders and mini-excavators and a quarter of the breakers reported stolen. Looking at *rollers and compactors*, Bomag made 26% of the plant reported lost, Wacker made 21%, Dynapac 11%, Benford 8%, with various other manufacturers contributing 5% or less each. JCB had manufactured 25% of the stolen *breakers/road hammers*. A further 10% were manufactured by Montabert and 8% each by Stanley and Krupp.

Generators were identified as one of the most frequently stolen types of plant. Honda had manufactured 29% of these, Haverhill 15%, Caterpillar and Stephill 6% each, with many others such as Madden and Petter, Trogan, Compair, Wilson, Rewagen, Genset, Lux, Greco, Yamaha, Kubota and Hilti 5% or less each. Of the 41 stolen *compressors*, 29.2% were manufactured by Ingersol Rand, 26.8% by Atlas Copco and 14.6% by Compair. Other less frequent compressor manufacturers include Massey Ferguson, Zitair and Toros.

Table 11 summarises the makes of the most frequently stolen plant. The manufacturers are listed in order of theft frequency, the first being the most commonly targeted.

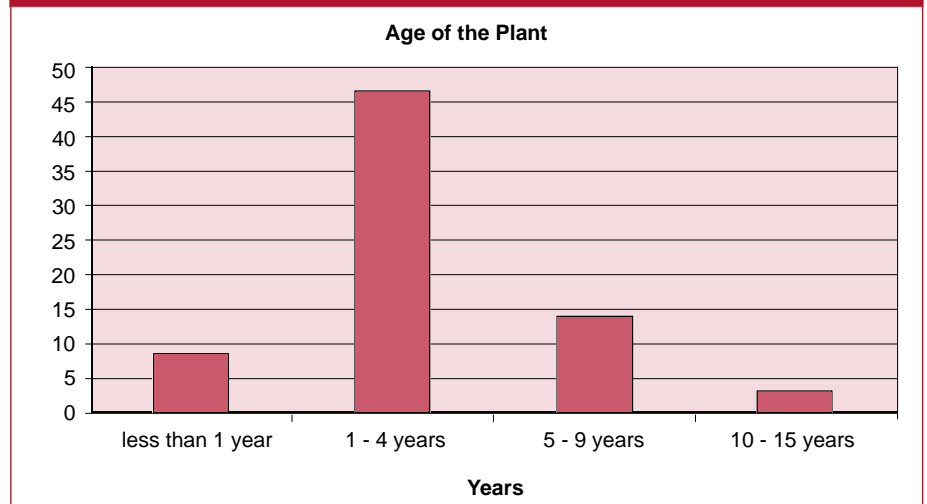
Table 11: Most common manufacturers of equipment reported stolen	
Type of Plant Stolen	Most Frequent Manufacturers
Generator	Honda, Haverhill, Stephill, Caterpillar
Breaker/Road Hammer	JCB, Montabert, Krupp, Matilia
Compressor	Ingersol Rand, Atlas Copco, Compare
Compactor	Bomag, Wacker, Dynapac, Benford
Cutter/Sheerer	Stihl, Partner, Norton Clipper
Excavator (360)	JCB, Hitachi, Caterpillar, Komatsu, Hannix
Large Backhoe Loader	JCB, Caterpillar, Massey Ferguson, Komatsu
Mini Excavator	JCB, Komatsu, Pell Job, Kubota
Water Pump/Bowser	Mainway, Honda, Wacker, Mawsley
Dump Truck	Thwaites, Compare
Lighting Tower	Strumech, Boss

Age of plant

Figure 3 illustrates the age distribution of the stolen plant. The oldest equipment reported stolen had been purchased in 1982, making it 15 years old at the time of theft. Stolen plant was found to be eight years old on average, although 55% of the equipment reported stolen was four years old or younger. Given the hard wear that construction plant receives, and the nature of the hire industry, these figures showing the relative youth of stolen plant are likely to reflect the age of the plant parc, as will be explained.

This distribution stands in contrast to that for car theft. Data from the 1997 Car Theft Index (Crime Prevention Agency, 1997) suggests that thefts of new cars are relatively infrequent, rising to a peak for cars registered in 1988. Various reasons, such as improvements in vehicle security, have been attributed to the trend in car theft rates. Plant has not seen such investment in security and is subject to much harder wear than many other vehicle types, making the theft of newer equipment more appealing, and thus more likely. Moreover the majority of equipment in use is thought to be owned by hire companies (PSDB, 1998), who replace their equipment every two to four years. The used equipment is sold on the second-hand market, but is often exported. This means that the bulk of the plant stock in GB will be relatively young.

Figure 3: Age of the stolen plant



Location and time of theft

This section looks at the location and times of the thefts, to allow an understanding of the theft context to be developed.

Type of area

Table 12 shows that residential areas have the highest rate of theft. Nearly a third (30%) of the plant was parked (or left) in a residential area when it was stolen. Local authorities lost nearly half (44%) of their stolen equipment from this type of area. Following this, industrial estates have a similar, but slightly lower, theft rate (28%), although two thirds of the transport companies’ equipment was stolen from these areas. Nearly one fifth (18%) of the thefts were from rural areas, and most of these were from agriculture and forestry industries (60%). Other industries also lost equipment from rural areas, but to a much lesser extent. ‘Other’ areas (motorway developments, airports, hospitals and universities) accounted for 16% of the plant thefts – one third of the stolen Local Authority equipment was taken from these types of location.

Table 12: Type of area plant is stolen from (all industries)

Type of Area	Percentage of Stolen Plant
Residential Area	30
Industrial Estate	28
Rural Location	18
Other	16
Shopping Area	5
Unknown	3

Parking location

Most thefts occurred from building sites – nearly one quarter (24%) of the equipment was stolen from these. Table 13 shows the parking locations and the percentage of thefts from these areas in descending order. Building sites were mainly situated within urban areas. One quarter were located within industrial estates, and 35% were in residential areas. Only 13% were found within rural locations. This contrasts with road construction sites, 38% of which were situated within rural areas. Of the plant located by the roadside (not outside the operator’s home) at the time of theft, almost half (48%) were within residential areas, 27% were in rural areas and 10% were in industrial areas.

Table 13: Location stolen plant parked (all industries)

Location	Percentage
Building Site	23.5
Depot	17.3
Other	13.7
Road Construction Site	12.2
Roadside – Elsewhere	11.4
Inside Warehouse/Garage	6.7
Factory/Warehouse/Parking Area	5.2
Operator’s Home – Roadside	3.5
Operator’s Home – Elsewhere	2.7
Public Car Park	1.2
Quarry/Mine	0.4

Although only 17.3% of the reported thefts were of equipment left at a depot, local authorities lost over a half of their plant from such locations. Most depots (43%) were located on industrial estates, though 25% were within residential areas and 21% in ‘other’ areas. A third of transport company losses occurred from warehouse or factory sites. These are typically (71% of cases reported) found on industrial estates. Another third of transport company thefts were from locked garages.

In some cases, operators took equipment home with them, either leaving it at the roadside or parking/storing it off the road. Thefts from the roadside at the operators’ homes had the greatest impact on transport companies, a third of their losses occurring from these locations. Looking at thefts from operators’ homes, where equipment was taken off the road, the greatest single impact was on the agricultural and forestry industries, where 14% of stolen plant was from this type of location. Two thirds of the plant stolen from public car parks had been left in shopping areas.

Time of theft

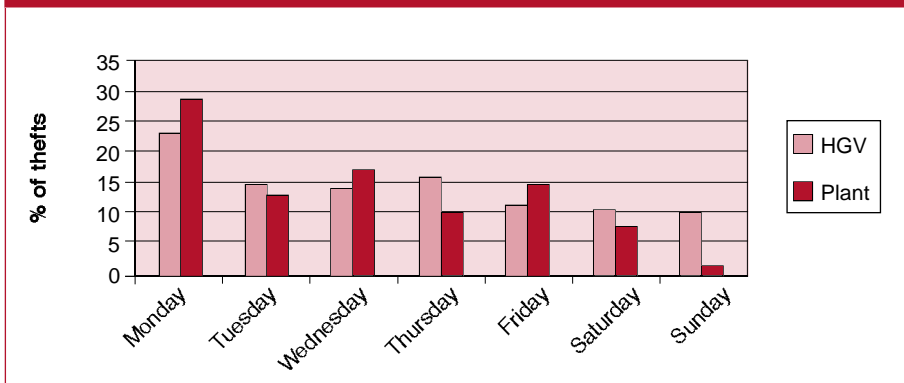
Nearly a third (29%) of all thefts were identified on a Monday. It appears common for stolen plant to have been taken over a weekend. This might reflect the time when most equipment is left unattended. Just over 40% of the stolen equipment last seen on a Friday was noticed missing on the following Monday. Over three-quarters of the stolen plant left on a Saturday was found stolen on a Monday

(77.4%) and 90.9% of the stolen equipment left on a Sunday was found to be missing on Monday.

Thefts during the week were frequently identified the following morning. For example:

- 57.6% of equipment last seen on a Monday was noticed missing on a Tuesday;
- 55.3% of plant last seen on a Tuesday was noticed missing on a Wednesday; and,
- 46.7% of equipment last seen on a Thursday was noticed missing on a Friday.

Figure 4: Comparison of plant and HGV day of theft discovery



Unaccountably, 66.6% of equipment stolen on a Wednesday was noticed missing the same day. These figures appear to be similar to those for HGV theft, where the bulk of thefts (23.2%) were noticed on a Monday. Figure 4 shows the comparison between the day an item was discovered stolen for HGVs and construction plant.

These figures are both in contrast to those for LCVs, in which Monday's theft detection rate was not reported to be any different to those of Tuesday through to Friday. It was suggested that the LCV theft rate actually fell at weekends.

Summarising plant theft

The profile of plant theft emerging is one in which small plant is particularly vulnerable. It appears that all sizes of plant are stolen, but trailer mounted and small non-driven plant were reported to be stolen in higher volume and to be at higher risk of theft than larger plant. Newer equipment is most at risk, but this partly reflects the equipment parc. Equipment receives hard wear and tends to be

replaced regularly, particularly by the hire industry. Building or road construction sites and depots are the most vulnerable locations for theft, with most losses occurring at the weekend.

Financial cost to victims

Respondents were asked to estimate the costs of replacing the stolen equipment. These varied greatly, ranging from £100 to £32,000. Most of the stolen equipment reported in this stage of the survey was small, however, and this is reflected in table 14 which shows the distribution of replacement costs. A small proportion of the respondents (6%) reported that they could not afford to replace the equipment stolen from them. Thefts appeared to hit agricultural companies particularly hard - while only 5.6% of the construction companies reported not replacing their equipment, 40% of the agricultural and forestry companies reported that they could not.

While the majority of the respondents did replace the stolen plant, the way in which they did so depended to a large degree on whether it was owned or hired. Owners of plant stolen were most likely to buy new equipment, 63% doing so, while 30% of them hired replacement equipment. Those who had hired the plant stolen were more likely to hire more, 82% reporting so. Interestingly, 15% of those who had hired the equipment stolen reported buying new plant in its place. Although the higher costs (£5000 or more) were more likely to be borne by equipment owners (buying replacement equipment) there was no overall statistically significant difference between the replacement costs reported by owners and hirers. While many stolen plant owners do purchase new equipment, ultimately even stolen hire equipment is replaced with new equipment by the hire company. The majority of hire companies will be insured for theft, and the insurance industry will therefore bear a large part of the cost of plant theft.

Table 14: Cost of replacing stolen plant

Cost	Percentage
Did not replace	6
Up to £5000	53
£5001-£10000	14
£10001 +	8
Unknown	19

In addition to equipment replacement, various less direct costs may also be incurred. Over a third (36%) of the respondents reported the loss of customers, revenue or business as a direct consequence of the theft. The impact seems to hit owners slightly harder: 40% of equipment owners reported such losses compared with 32% of those who had hired plant. The impact also seems to differ depending upon the nature of the business, two thirds of transport companies, 36% of utility companies and a third of local authorities report this. As well as loss of revenue, 16% of respondents suffered a reduction in their output. Again, owners appear to suffer more, with 19% of the equipment owners reporting reduction while only 11% of those hiring equipment do so.

Nearly two thirds (63.9%) of the stolen plant became the subject of an insurance claim, and a third (29.8%) of the respondents' insurance premiums increased following this. Again, the construction industries and the local authorities appeared to be most affected. The study shows that 35% of construction firms and 44% of local authorities reported increased insurance premiums. This is an interesting result as only 20% of the local authorities reported owning the stolen plant. It suggests that they were responsible for the insurance on the equipment they had hired.

Although many of the respondents reported that the thefts resulted in some inconvenience, this was not often critical to a company's survival. None of the respondents ceased trading and only a small proportion of construction companies had to make redundancies following the theft. The number of companies reporting the improvement of security following theft of their equipment is disappointingly small, only 13% doing so overall. Ownership, once again, influenced the likelihood of improving security; 18% of owners doing so while only 6% of hirers did. These figures support the contention that plant users do not generally consider security highly, an issue discussed in more detail in the next section. The fact that owners were more likely than hirers to consider security following a theft suggests the value of personal responsibility in driving further improvements in plant protection.

Recovered plant

Only 9.8% of the stolen plant had been recovered; 6.3% being reclaimed whole and 1.2% identified as broken up (no details were provided of the remaining 2.3%). Of the plant recovered whole, 43.6% showed no sign of damage. Where damage was reported, few details were given. However, a number of respondents did give limited details. The damage seemed generally not to have been very severe. One respondent's equipment had bent mud-guards, another had body panel and window

damage and two suffered damage through the radio being stolen. Two respondents indicated that parts of the plant were missing or had been changed, but did not verify how. One piece of plant had had the ID numbers removed, and another's ID numbers had been tampered with. A further four respondents' plant had been re-sprayed, one had stickers removed and another had a window broken.

Figure 5: Example of a mini-excavator



(Photograph courtesy of Caterpillar and Finning (UK) Ltd)

5. The use of security equipment

This section will outline the use of security equipment both on the plant itself and at the location at the time of the theft. Changes to security following the thefts are also considered.

Plant security

The study indicates that relatively few security measures were available on the equipment itself. The most common measure was the recording, or allocation, of VIN or other ID numbers (such as chassis or engine numbers). Given the importance of equipment inventories, it was surprising to find that only 62% of the respondents reported using these numbers to identify their plant. Table 15 indicates the proportion of respondents from each industrial sector who reported recording the VIN/ID numbers on their plant.

Industrial Sector	% of VIN or other ID numbers	Number of respondents
Local Authority	78	7
Electricity/Gas/Water Supply	77	17
Other	63	24
Construction	60	107
Agriculture/Forestry	60	3
Transport/Storage/Communication	33	1

Certain types of number (such as VIN, chassis or engine numbers) are generally present on plant before it is purchased or hired. A third of the respondents, however, reported allocating additional ID numbers to their plant. Only 5% of the respondents reported having used covert security markings. None reported having etched registration or serial numbers onto their equipment. Additionally, only 4% of respondents had their plant registered with the DVLA. Only an eighth (12.5%) of the respondents had their plant listed on a commercial register.

The most commonly used after-market security device reported by the participants was a simple padlock and chain. Even given the simplicity and low cost of this method of security, however, only 22% of the respondents reported that their equipment was chained at the time of its theft. Even fewer respondents reported the use of other types of lock at the time of the theft. Fewer than one percent of the respondents reported using any type of mechanical steering/gear stick lock, ram

lock (to lock turning front wheels) or attachment lock. None of the respondents reported having used an arm/boom lock (lockable sheaths for use on hydraulic rams) or crawler lock (similar in function to motorbike wheel locks, to stop tracks from turning) to secure their equipment.

Only 2% of the respondents reported having had manually set alarms on their equipment, and none reported using automatically set alarms. Immobilisers also appear to be used infrequently. Manually set immobilisers were reported by only 1.6% of the respondents, none having used automatically set immobilisers. Almost one fifth (19.6%) of the respondents' equipment was painted in corporate colours. Despite the anecdotal success of passive electronic tagging and active tracking systems for all types of vehicle, only 1.2% of the respondents reported having had these on their equipment.

Location security

Table 16 indicates various types of site security, and the percentages of respondents reporting having used them at the time of the theft. The study reveals that 20% of the respondents did not have any security measures in force at the site where the plant was left. Nearly a quarter (22%) of the organisations had temporary compounds and a further 15% had permanent compounds. However, despite 37% of the respondents having some form of compound in which to leave their equipment,

Site Security Measure	Percentage Using
Locked Gate	23.3
Temporary Compound	22.4
No Security	20.0
Other	17.6
Road side Lighting	16.1
Permanent Compound	15.3
Security Guards on Premises	13.3
Security Lighting	11.8
Alarmed Premises	8.6
CCTV	5.9
Locked Garage	3.9
Manned Access Point	3.1

only 23.3% reported having locked gates at the site. Although a locked compound represents a sensible level of security, it is not enough to stop theft on its own. When asked how access was gained to the stolen plant's location, a number of respondents reported that the site gates were the initial point of entry during night-time thefts. Padlocks, chains and bolts were cut or sawn off, and in a number of incidents the gates were lifted off their hinges intact. In some cases the equipment was stolen during the day when the gates were open anyway.

In relation to building sites, 27% had no security measures in place at all. Five percent had garages where plant could be locked away and 3.3% had security lighting. None had CCTV cameras in operation. Although only 5% of the building sites had manned access points and none had alarms in place, 11.7% did have security guards on the premises. In contrast to the building sites, depots generally had a high level of security; 22.7% had CCTV in operation, 27.3% had security lighting, 22.7% had their premises alarmed and 18.2% also had security guards. Only 2.3% of the depots had no security measures in place.

Security improvements following theft

Equipment security

When asked what plant security measures the respondents implemented subsequently to the theft, 8.6% ensured that their replacement equipment had VIN or other ID numbers. The purchase of chains and padlocks was made by 7.8% of the respondents specifically to use with their replacement equipment. A further 7.1% of the respondents had their equipment painted in corporate colours to enable it to be easily identified. A small number of respondents introduced some of the locking systems that were not commonly used previously, for example, arm/boom locks, attachment locks and hitch clamps. No one reported purchasing crawler locks. Electronic tagging (passive) and tracking (active) systems were purchased for the new equipment in 6.2% of cases. Only 2.0% reported registering their new equipment with the DVLA and 3.9% with a commercial register. Overall the proportions of people reporting improvements to equipment security are surprisingly, and disappointingly, low.

Location security

As well as improving equipment security measures, the respondents were also asked what improvements had been made to the location where the equipment had been left. The study showed that, following the theft, 9% of the respondents started to lock gates to improve the security of the plant, 7% kept unused equipment locked in a garage and 6% installed CCTV. Coupled with these improvements, a further 5.1% alarmed the premises and 4.7% introduced security lighting. A further 4.7%

of the respondents established a permanent compound at the location where the equipment was left and 8.2% hired security guards to patrol the site in order to improve the security of their plant. As was noted with the item security devices, the proportion of respondents reporting improvements in site security was surprisingly low. There maybe a number of underlying reasons, but this suggests that awareness generally needs to be raised as to the owner/operators' responsibility for their equipment safety.

Advice and training on plant security

Respondents indicated that they had received advice and training from a range of sources. Among these sources are the Construction Plant-hire Association (CPA), The Equipment Register (TER), the Construction Industry Theft Scheme (CITS) and the Contractors Mechanical Plant Engineers (CMPE). Many also received training and/or advice from their company security group. A number of respondents cited police officers and police leaflets as their sources of information on methods of keeping plant safe. It must also be noted, however, that in many cases advice from the police was received only following a theft. Despite the range of information sources, there is still room for improvement. While 62% of respondents reported that they had received advice, this suggests that 38% had not. Beyond general advice, more detailed training was less common. Only 16.5% reported having received training on plant security. Of the respondents who had received advice, 77.2% felt that it was useful, but of those who received training, only 25.4% found it useful to them. These results suggest that both the information and its dissemination could benefit from review. It is important to ensure that the message reaches as wide an audience as possible, in a manner appropriate to the various different targets (i.e. different industries, different levels of staff etc.).

6. Recommendations for action

The results outlined in the previous sections suggest that plant is more at risk of theft than any other type of vehicle except motorcycles. While the figures need to be treated with caution, over 24,000 pieces of equipment were estimated stolen in 1997, anticipated to cost well in excess of £66¹/₄ million. This figure is based on the depreciated value of the equipment alone and does not include the range of additional costs outlined in section 5. Accounting for the nature of the equipment stolen, the locations at which it is kept and the level of security used, there are a range of recommendations which can be made to improve various aspects of plant security. If these are integrated into a systematic program of theft reduction measures they should lead to a reduction in the vulnerability of plant to theft.

Particular care is required for the security of small, easily moved, plant. 'Non-driven' plant has both the highest volume and risk of theft. This equipment is most vulnerable precisely because it is so easy to move. Being small it is relatively portable, with little security on the equipment itself it is easy to take and operate, and with low levels of security on sites it is easy to gain access to it in the first place. It is relatively easy to suggest security improvements for large plant, but the particular problems posed by small plant require more imaginative and systematic intervention.

Plant users (either owner or hirer) are in the key position to improve the safety of the plant in their care. If they are *not* motivated to secure it themselves, it may be left unprotected when not in use. It is in the interests of the equipment owners, whether private or hire-company, to ensure that those using the equipment act responsibly, taking advantage of all available security features to ensure the safety of the equipment in their trust. Construction industry practices sometimes conflict with the requirements of security. For example, the need for equipment to be available to any of the workforce as and when required is difficult to reconcile with item-specific keys held by single users. This need not be the case, however, if working procedures are developed with equipment security in mind.

Operators who do not own the equipment they use often have no motive to take particular care of its safety. With no financial (or other) penalty following the loss of equipment there is little incentive to take responsibility for it. In addressing plant security it is important to consider not only the physical security of the plant and it's location, but also the working culture surrounding its use. Users may require more incentive than advice alone to take responsibility for the equipment in their care. It is possible that wider measures, such as making nominated users financially or legally responsible for the equipment, may be required to drive a 'cultural' change – to change the attitudes of users, making them automatically

more security conscious.

Action for plant manufacturers

- **Targeting high risk equipment.** It has been suggested that careful targeting of certain car makes and models is likely to produce more significant reductions in theft than a general approach. Focusing upon the high risk, high theft-volume items of plant equipment should achieve more rapid reductions in theft, for less resource input, than a broad-brush approach. Drawing on the data produced in the current work, it is suggested that focus on key types of small, non-driven equipment (particularly generators, cutters and road hammers), might lead to the most rapid reductions in plant theft. *This does not mean that the other types should be ignored*, simply that resources should be focused for maximum and immediate benefit.
- **Improving equipment security** . Improving security fitted at the point of manufacture is expected by PTAG to be an effective way of reducing plant theft. A simple measure which PTAG has been pushing for is the end of ‘single key’ operation (where a single key pattern operates all of a manufacturer’s equipment). While making the general use of equipment slightly less convenient on large construction sites it would considerably improve the security of the equipment. PTAG also recommends the increasing use of effective immobilisation and, where appropriate, the prevention of entry to plant.

While these measures can clearly be applied to large plant (such as excavators, loaders etc.), careful thought is required on improvements to small plant too. The use of item-specific keys may be applied to equipment such as generators, compressors and pumps, and it may also be possible to use various types of immobiliser (e.g. mechanical, electrical). Attachments and smaller equipment which do not require keys to operate, or are not self-powered, could benefit from some thought into designing-in protection.

- **Marking components.** The survey has shown that plant does not typically have a high level of marking. PTAG has recommended that all plant has a Vehicle Identification Number (VIN), or a Product Identification Number (PIN) in the case of non-vehicular plant. It is also recommended that equipment have additional covert marking in a number of places. The amount of such additional numbers will depend to a large extent on the type of plant; large equipment is easier to mark in various places, while some small equipment may be difficult to mark more frequently. Despite these potential problems, such marking, and the user recording of these numbers, should be encouraged.

Actions for security device manufacturers

- **Targeting high-risk equipment.** Just as manufacturers should focus on improving the security of high risk plant first, so after-market security devices should be aimed at this type of equipment. Increasing the awareness of high-risk plant should prompt users to improve the security of their equipment. The same types of equipment – predominantly small non-driven – need to be targeted by after-market security manufacturers as by plant manufacturers.
- **Improving the use of after-market security devices.** With increased security on new plant, it is likely that thieves will turn their attention to the older plant that is relatively unprotected. There will be a need for after-market security equipment to protect this older equipment. Many types of device are available, from simple mechanical locks through to electronic immobilisation and tracking devices and all will have a role to play in security improvements. The research has shown that there is currently little use of such equipment on plant and its uptake can be expected to play a significant deterrent role. Almost all currently available security devices are aimed at larger driven plant, but many can also be used with smaller equipment. Trailer mounted and mobile small equipment may be secured with equipment such as chains and hitch or wheel clamps. Again, thought is required on the design of security to protect smaller plant.

Actions for plant owners

- **Keeping good records of equipment.** Owners should maintain adequate records and paper trails for all their equipment so that its location and user can be identified in the case of theft. Equipment serial numbers and locations should be recorded as a minimum, so that in the event of theft police can be instructed how to identify it. In addition to the recording of serial numbers, the rigorous documentation of all aspects of an item's work life should be considered. Routine recording of job location and user might form part of a culture of responsibility for the equipment, ensuring that greater attention is paid to its care. Transit documentation should be provided to ensure that equipment is not removed from a location fraudulently, and to aid in police roadside checks.
- **Install effective security .** Owners should ensure that the equipment they use or hire-out has adequate security. While the initial outlay might seem an unwanted expense, loss of equipment can have a significant impact on business. The survey has shown that the use of security on both equipment and locations is generally poor and this indicates a clear area for rapid improvement.

- **Targeting high-risk equipment.** The nature of the equipment, and the locations at which it is typically found, produce particular problems that need to be addressed. Building sites, road construction sites, depots and the roadside are all locations that are particularly susceptible to thefts, especially at weekends. Owners of plant being used in these locations need to be aware of the risks and ensure that adequate security is available on both site and equipment.
- **Ensure responsibility for plant.** This research showed that almost half of the plant used by the respondents was hired, though as much as 80% of all plant used may be hired (PSDB, 1998). This suggests that hire-companies need to make it clear who has responsibility for plant, and when. It has been suggested that users hiring equipment are not as careful with it as they would be if they owned it, many not paying any attention to the security of the equipment. Support for this is shown in the current research, those losing hire equipment being less likely to improve security than those who had owned it. If users understood that they had responsibility for the equipment during the time they hired it they might be more likely to take care of it. Incentives may be required to ensure users 'ownership' of responsibility, such as making them liable for replacement in the event of loss (unless a level of care can be shown).
- **Provide security advice to users.** Much plant is owned by hire companies but used by others. It is important that the operators of the plant are aware of the risk of theft, and how it occurs. They should not only be informed of their responsibility for the equipment's safety, but also given advice on what security equipment is best to use, how to use it and how best to store the plant when not in use. The security requirements may differ significantly depending upon the type of plant being used, but might include:–
 - **On plant** – padlocks and specialised locks (e.g. crawler locks), overt and covert marking, cabin hoods and locks, unique key operation, tagging and tracking devices etc.
 - **On site** – perimeter security, lockable gates, CCTV, security guards, lockable storage containers and careful parking of equipment to block access to easily-moveable or high-risk plant when it is not being used.
- **Register equipment.** This survey has shown that little equipment is registered, either with the DVLA or with dedicated equipment registers (such as The Equipment Register). The advantage of equipment registration is the centralised holding of information on ownership. Should any item of equipment be stolen there is a clear record not only of ownership, but also of all relevant serial

numbers and unique identifying features which can be used in subsequent identification. Voluntary registers often offer an investigation service, assisting the police in the identification and recovery of stolen equipment.

Actions for plant operators

- **Take greater responsibility** . A key finding of the current work is that operators need to be much more security conscious. The Home Office produced a leaflet, in 1998, entitled “Plant Theft: Crime prevention advice for owners, hirers and users”. This gives advice on what to be aware of:

- at the time of purchase;
- when sending equipment to site;
- on site;
- recovery of plant from the workplace;
- staff training;
- security of plant on site;
- in the event of theft; and,
- general site security.

Users who have hired plant must be particularly aware of their responsibility to ensure its safety as they would their own equipment.

- **Use plant security** . Where plant has security equipment fitted, the operator should ensure that it is used appropriately. Given the low use of security equipment on plant, this might be considered one of the most fundamental messages of the current research.
- **Improve site security** . Operators should also be aware of, and responsible for, the security available at the location at which the plant is being used. If plant is easy to remove unhindered then security on the equipment itself is made relatively redundant. Careful consideration should be given to site access, and how to restrict and protect it.

Actions for the police

- **Awareness of plant at risk** . The current research has indicated what types of equipment are most at risk, the types of location they are taken from and the times at which they are most frequently taken. The police need to be aware of:
 - how to identify different types of plant;
 - where to locate ID numbers on different equipment;
 - where equipment is most vulnerable; and,
 - how to secure equipment and the locations it is used.

This information will be of use when dealing with theft reports, enabling more accurate and systematic recording. When stolen equipment is recovered, or plant is examined during roadside checks, knowledge of serial number location will aid identification. Knowledge of security issues, and how to implement them, will help police when consulting with site operators on their security. Police forces should evaluate the problem of plant theft in their areas and have sufficiently trained officers available to deal with it. Where this is not the case, training should be provided.

- **Tackling stolen goods markets.** The low recovery rate for plant suggests that thefts are generally carried out by (or for) organised gangs who have a market to re-sell into. This low recovery rate makes the emphasis on theft prevention critical. While overt and covert parts marking, and distinctive colour schemes, may assist in later recognition, reducing the ability to sell stolen plant will play a far more influential role in driving the theft figures down. Given the high theft rate of plant between one and four years old, the police could target the second-hand market to reduce the ease with which this equipment can be sold on.
- **Improve the recording of plant theft.** The data provided by each of the sources in phase two of the work were found to have different formats. This suggests a case for the standardised recording of plant at the point of theft reporting. One of the original constraints on data collection was the dispersal of plant across the 'vehicle' and 'property' categories on the Police National Computer (PNC). Organised plant theft crosses force boundaries, and may often cross national boundaries. If the police are to be effective in reducing this crime, records must be comparable wherever they are recorded or stored. This is essential to ensure that equipment recorded as stolen in one location can be matched to equipment checked or recovered in another. At present the recording of stolen plant is subject to such variation that subsequent identification can be difficult even following recovery.
- **Use of a comprehensive database.** The improvement of existing vehicle crime records is supported by ACPO. Use of a comprehensive database for all vehicle theft and recovery is recommended and applies equally to plant. An improved ability to record plant details, and track trends in theft and recovery, should allow a greater capacity to assess plant theft in the future. This will enable responsiveness to changes in the nature of plant theft following any improvements that might be made to the current situation.

Action for Insurers

- **Drive change in security use.** Anecdotal evidence suggests that many *owners* (particularly corporate rather than small operators) do not insure their plant, or self-insure as a result of high premiums and excesses. A lack of security use has already been identified as a problem by the insurance industry, a fact partly contributing to the rising costs of insurance. The use of incentives, such as discounted premiums and lowered excesses, could be offered to companies able to show that they have a responsible attitude to security. Insurers could consider the use of DVLA registration or membership of an equipment register as a precondition of insurance. In this way the insurance industry may be instrumental in driving the development of a security culture within the construction industry. It would appear to be in the insurance industry's interests to support such changes as the research suggests that almost all hired equipment is replaced, with direct consequences for the insurer. While premiums can be increased to raise revenue, a reduction in claims (through improved theft prevention) is likely to have a greater impact on annual profit.

Conclusions

Partnership initiatives between manufacturers, owners, operators and police might be expected to be highly beneficial in helping to reduce the problems of theft. Actions on the part of any single agent may do no more than temporarily slow the theft problem. By combining better manufacturer fitted security equipment, with increased operator awareness and better police capability, a real increase in equipment safety, and decrease in equipment theft, can be expected.

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Appendix A – Plant identified in the survey

The following list of plant was identified during discussion with the Plant Theft Action Group. This was used in both phases of the research to indicate the type of equipment being considered.

Large driven equipment

excavator (360°)
large backhoe loader
large loader (excluding backhoe loaders)
bulldozer
tractor
dump truck
large roller/compactor (ride on)
trencher
grader
scraper
road planer/milling machine
asphalt paver
large forklift
telescopic handler
access platform
crane
Other (please specify)

Small driven equipment

mini excavator
small backhoe loader
small loader (excluding backhoe loaders)
skidsteer loader

site dumper
small roller/compactor (ride on)
trencher
small forklift
access platform
Other (please specify)

Non-driven equipment

breaker/road hammer
crusher/pulverizer
cutter/shearer
grab/grapple
piling equipment
drilling/boring equipment
roller/compactor (walk behind)
compressor (trailer mounted)
generator (trailer mounted)
pump (trailer mounted)
chip sprayer/grit spreader
conveyor/elevator/feeder
lighting tower
temporary traffic light
welding equipment
access platform (trailer mounted)
Other (please specify)

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