

# The Forensic Science Service



# Contents

<b>Executive Summary</b>	<b>1</b>
<hr/>	
<b>Part 1 Introduction</b>	<b>9</b>
The Forensic Science Service	9
Scope of this examination	19
Study methodology	19
<hr/>	
<b>Part 2 Meeting the needs of customers</b>	<b>22</b>
Contribution to the criminal justice system	22
Customer satisfaction	30
Speed of delivery	33
Communication	44
<hr/>	
<b>Part 3 Assuring the quality of forensic evidence</b>	<b>49</b>
Quality management	49
Audit and quality assurance	54
Educational standards and standards of personal and professional conduct	59
<hr/>	
<b>Part 4 Custody of forensic evidence</b>	<b>63</b>
The risks to forensic evidence	63
Arrangements to prevent the loss, damage or contamination of forensic evidence	64
Management and other independent checks	71
<b>Appendices</b>	
1. Organisation structure	75
2. Sampling methodology for case examination	76
3. Survey of police forces	78
4. Reference panel	79

# Executive Summary

The purpose of the Forensic Science Service (the FSS) is to support the administration of justice, primarily the law enforcement agencies, by providing:

- impartial scientifically based evidence to support the investigation of crime; and
- expert evidence of opinion and fact to the courts.

This report examines service delivery by the FSS, and in particular the extent to which the FSS:

- meets the **needs of customers in the criminal justice system** (the police, the Crown Prosecution Service, the defence, the courts, and the investigative and enforcement arms of HM Customs and Excise);
- controls and assures the **quality of scientific work**;
- ensures the **safety and integrity of forensic evidence in its custody**.

## Main findings

### On meeting the needs of customers in the criminal justice system

---

The FSS's customers are generally satisfied with the service it provides, and consider that the FSS meets their needs and makes a significant contribution to the criminal justice system. Though the FSS has reduced turnaround times for casework significantly in recent years, the FSS itself and its customers consider that more could be done to improve speed of delivery.

---

*Main report  
paragraphs 2.2 - 2.7*

- Forensic science plays an increasingly important role in the investigation and prosecution of crime. The police and the Crown Prosecution Service consider that the FSS makes a significant contribution to the needs of the criminal justice system. FSS forensic reports generally meet customer needs and are readily understandable by users, in particular the Crown Prosecution Service. The FSS is actively shaping its organisation, developing products and rearranging administrative processes to meet the needs of customers.

*Main report paragraphs  
2.8 - 2.16*

- FSS scientists are required to assess how far their work is helping to further investigations. Although the criteria for assessing cases are clearly set out, some cases are not assessed and it is not clear why this is so. Over half of the cases which are assessed are judged to provide strong or conclusive evidence to advance an investigation. Police forces undertake similar monitoring of cases separately, but the results are not shared.

*paragraphs 2.17 - 2.22*

- The FSS has systems in place to measure customer satisfaction. Customers are generally satisfied with the service provided, and the large majority consider that the service is improving. However, they consider that the FSS could do more to improve the speed of delivery. Recorded complaints relate to a very small proportion of workload but are likely to be understated.

*paragraphs 2.23 - 2.29*

- Delays in examining forensic evidence can hinder police investigations, and so timeliness is a key issue for customers. There are wide variations in the standard target delivery times of the FSS's six laboratories. The FSS is in the process of setting common target times, and monitors performance across the laboratories.
- The FSS has reduced turnaround times for casework significantly in recent years. It achieved the key target to meet 90 per cent of delivery dates agreed with customers in 1994-95, and again in 1995-96, but in 1996-97 only 81 per cent of all casework was completed within delivery dates against the 90 per cent target (Figure 1). The main elements of the shortfall related to DNA work, and to the lower performance levels of the Metropolitan Laboratory, formerly the Metropolitan Police Forensic Science Laboratory, which merged with the FSS in 1996. The Metropolitan Police Service considered that the difference in performance had arisen from the historical requirement for the single laboratory to provide a full service to the Metropolitan Police and to respond to a different crime mix, especially in relation to terrorist cases.

*paragraphs 2.30 - 2.43*

- The FSS is at the forefront of technological developments in the provision of forensic science, most recently in the development and implementation of DNA analysis to support crime investigation and in processing high volumes of DNA samples for the National DNA Database. Senior police officers consider that the introduction of DNA techniques has been comparable to the advent of fingerprints in terms of its impact on the use of forensic science in crime investigations and on the outcomes of investigations. The National DNA Database, of which the FSS is custodian and the principal supplier of analysis, was the first of its kind in the world and was implemented in April 1995. As at

**Forensic Science Service's  
key performance targets  
1995-96 to 1997-98**

**Figure 1**

*The FSS achieved only two out of its five key performance targets in 1996-97. Problems in meeting the increased demand for DNA work, an arson attack at one of its six sites and the merger with the Metropolitan Police Forensic Science Laboratory contributed to the under performance.*

<b>Service level targets</b>	<b>1995-96 results</b>	<b>1996-97 results</b>	<b>1997-98 forecast<sup>1</sup></b>
Maintain accreditation to UKAS National Measurement Accreditation Service and BSI ISO 9001 standards	maintained and extended to other areas of work	maintained and extended to other areas of work	maintained and extended to other areas of work
Completion of customer satisfaction survey (every 2 years)	n/a	completed in summer 1997	n/a
Meeting 90% of delivery dates agreed with customers	93%	84% <sup>2</sup>	82-87% <sup>3</sup>
<b>Financial targets</b>			
Recovery of full economic costs; target 100%	102%	97% <sup>4</sup>	107%
Cash unit cost per hour of output <sup>5</sup> ( <i>targets</i> )	£82.19 (£81.83)	£82.53 <sup>6</sup> (£81.33)	£79.25 (£80.41)
Efficiency savings (not a formal FSS target) <sup>7</sup> ( <i>targets</i> )	1.53% (1.98%)	2.04% (3.69%)	6.5% (3.9%)

- Notes:
1. Forecasts for 1997-98 provided by the FSS.
  2. Excludes work of the Metropolitan Laboratory. When included, performance falls to 81 per cent.
  3. The forecast range excludes the work of the Metropolitan Laboratory. When included, forecast performance falls to 75-80 per cent.
  4. The FSS ascribes this shortfall to costs following the arson attack at the Wetherby site and a two month delay in commissioning the DNA unit at the Metropolitan Laboratory.
  5. This target relates to the total cost of resources used for each hour of FSS output. Any efficiency savings the FSS is required to make are expressed using this measure.
  6. Excludes exceptional costs associated with the closure of Aldermaston, the arson at Wetherby and the merger with the Metropolitan Police Forensic Science Laboratory.
  7. This target is the percentage efficiency saving per unit of FSS output.

Source:  
Forensic Science Service Annual  
Reports

December 1997, the Database held information on some 250,000 suspect samples and 27,000 crime scene samples; and there had been over 20,000 matches of either a suspect to a crime scene or one crime scene to another.

*Main report  
paragraphs 2.30 - 2.43*

- The FSS has however experienced difficulties in processing the high volume of DNA samples submitted by police forces, particularly samples from suspects. This arose from a variety of factors including the time needed to introduce and prove the new technologies. Demand for the new service was hard to predict, and submissions from police forces continue to grow at a rate significantly above that originally forecast with the Association of Chief Police Officers. A backlog of crime scene samples was eliminated by autumn 1997. The backlog of the high volume suspect samples requiring inclusion on the National DNA Database currently stands at about 120,000. The FSS aims to eliminate this backlog by the end of 1998.

*paragraphs 2.44 - 2.52*

- Communication between the FSS and its customers has improved, and the FSS is educating customers about the capabilities of forensic science. In some types of investigation it is important that the FSS has comprehensive details of the case and the evidence, including a list of items not submitted for analysis. More could be done to improve the information provided by customers on individual cases.
- The FSS has a contract with HM Customs and Excise and service level agreements with four police customers. It is developing these further with a view to trialling a model service level agreement with other police forces later in 1998.

### **On maintaining the quality of scientific work**

---

The FSS has its own Quality Management System which meets recognised national and international standards. The FSS seeks to ensure work meets these standards through internal and external audits, but not all audits were completed, and not all actions arising from the audits had target dates for completion. The general picture from the results of the 1996-97 quality assurance was one of improving standards.

---

*paragraphs 3.2 - 3.7*

- All scientific techniques are validated internally and externally before use by the FSS to check that the methods are scientifically valid and that the FSS has the appropriate resources, both staff and equipment, to operate them.
- In order to minimise the risk of quality failures, the FSS has its own Quality Management System which meets recognised national and international standards and is accredited by independent standards organisations. The system documents about 70 per cent of the scientific and administrative procedures of the FSS, and provides complete coverage for around 98 per cent by value of FSS products. More specific, detailed standards for particular

products are being developed, starting with those most frequently provided to customers. Product standards have currently either been established or are under development for around two-thirds by value of FSS products.

*Main report  
paragraphs 3.8 - 3.9*

- Scientific staff record all casework activities. All results are subject to review by a second authorised scientist before being released to customers.

*paragraphs 3.10 - 3.12*

- The FSS has three separate but complementary arrangements in place to provide quality assurance of its work. These are external quality audits, internal system audits and casework quality assurance trials. The general picture from the results of the 1996-97 quality assurance was one of improving standards, although only two-thirds of the internal quality audits which cover all the FSS's procedures, both scientific and non-scientific, had been completed, ranging from half at one site to around 90 per cent in two others.

*paragraphs 3.13 - 3.15*

- Some 60 casework quality assurance trials were conducted in 1996-97 involving some 1,000 scientific tests. The tests yielded a low level - 1.5 per cent - of unsatisfactory results. In one case only, the result could have incorrectly linked a suspect to a crime; and in the remainder the results failed to identify a link between a suspect and a crime. For each unsatisfactory test result the trial assessor found that the overall conclusions reached in the trial would not have been affected because of the weight of evidence obtained using other tests.

*paragraphs 3.16 - 3.21*

- Where the audits and trials identify problems with the operation of the Quality Management System, the FSS establishes what corrective or improvement actions are required and has a system to ensure that these are followed through. However, not all actions are given target dates. We found that those without target dates were more likely to remain outstanding for longer than those for which target dates had been set.
- While the FSS maintains local records of actions taken, it has not maintained a central record since 1995-96. This limits the extent to which senior management of the FSS can identify trends in errors identified and actions taken, and check on the progress of actions for a particular site or work area on the basis of routinely available information. The FSS recognises that a single central record is the best way forward and is in the process of procuring a computerised system to be in operation during 1998-99, which will support the follow-up of actions arising from quality assurance.

*Main report  
paragraphs 3.22 - 3.26*

- Nearly three-quarters of FSS staff are scientific grades with relevant degrees. Staff are expected to demonstrate the highest possible professional and personal standards and integrity, working to an established Code of Practice. The FSS is participating in the “Investors in People” programme, but implementation has been delayed due to the work arising from the merger with the Metropolitan Police Forensic Science Laboratory.

### **On the safety and integrity of forensic evidence in FSS custody**

---

The criminal justice system requires the FSS to demonstrate the integrity of all items and casework material in terms of maintaining evidence intact, without loss or addition, and ensuring that the chain of custody remains sound, so that evidence presented to the court is reliable. The FSS has guidelines to counter the risk of items submitted to it being lost, damaged or contaminated, and these guidelines are generally being followed. In certain areas such as the storage of items, physical security and security practices there is a need for improved arrangements which the FSS recognises and is taking action to address. Generally our findings were not such as to call into question the effectiveness of the FSS's arrangements in relation to the integrity of the evidence in its care.

---

*paragraphs 4.4 - 4.5*

- The main risks to forensic evidence arise from the potential theft, loss, contamination or deterioration of items in the FSS's custody. Consequential losses could damage the criminal justice system through loss of credibility of the FSS.

*paragraphs 4.6 - 4.10*

- The FSS has guidelines to counter the risk of damage to or loss of forensic evidence, and those concerning access to sites are generally being followed. There is a need to improve arrangements for storing and recording the movement and location of items in the FSS's custody, and the FSS is taking action to address this.

*paragraphs 4.11 - 4.13*

- There are guidelines for restricting access to the more sensitive parts of FSS sites and for the movement of items. The sites have separate secure storage areas for high risk and valuable items. Guidelines were being followed in some areas, but we drew attention to some weaknesses in arrangements and the FSS is taking measures to address them.

*paragraphs 4.14 - 4.19*

- There are documented procedures to ensure the integrity of evidence submitted by customers; these appear to be working satisfactorily. Known incidents of forensic evidence being contaminated when in the FSS's custody are rare.



*Main report  
paragraphs 4.20 - 4.21*

- All FSS sites have facilities for receiving and storing perishable items. The Quality Management System requires regular monitoring and this identifies occasional breaches.

*paragraphs 4.22 - 4.27*

- Several serious security breaches have occurred. One of these, an arson attack at the Wetherby site, destroyed items of forensic evidence and had severe financial consequences which were partly responsible for the FSS not meeting its financial targets in 1996-97 (Figure 1).
- The FSS commissioned independent reviews of security in 1991 and 1996. Both concluded that there was a need for improved security at FSS sites. The FSS took limited action following the 1991 review, but has already acted on some of the recommendations of the 1996 review. At the time of our examination, the FSS had set an action plan to improve physical security and security practices over the three years from 1997.

## **Recommendations**

*on meeting the needs of  
customers in the criminal  
justice system*

- In relation to assessment of the effectiveness of completed casework, the FSS should monitor compliance with criteria for selecting cases for assessment.
- Police forces' assessments of the usefulness of casework could give independent assurance about the validity of the FSS's own systems of assessment. The FSS should build on the work undertaken with the Association of Chief Police Officers in the North of England, and discuss more widely with police customers how the FSS could make use of forces' separate assessments of the quality of FSS casework.
- The FSS should supplement the guidance it already offers police forces, for example on packaging of items to maintain their integrity, with advice about what kind of additional case information could be useful to the FSS's analysis. Provision of such information could form part of the service level agreement with a force.
- Monitoring of outstanding cases should be supplemented with periodic age analyses, so that senior management is aware of how many cases are subject to lengthy delays.

- In striving to improve the consistency of service across its sites, the FSS should set timescales for important planned improvements, such as standard delivery times for different types of work, and product standards specifying the service a customer can expect. These developments will be key to the FSS's negotiations of service level agreements with customers, because they will help to clarify the elements of the service to be provided.
- on maintaining the quality of scientific work*
- The FSS should review the coverage of internal quality audits with a view to developing a schedule of essential audits which can realistically be completed to time. It should consider whether a dedicated audit team would provide a more effective and consistent means of carrying out internal quality audits across all sites.
  - The FSS's procedures for following up audits with corrective and improvement actions would be strengthened if target completion dates were set in all cases.
- on the safety and integrity of forensic evidence in FSS custody*
- Basic stock controls should be instituted to monitor the movements of items in FSS's custody, and to ensure that available storage space is maximised by returning items to customers as soon as they are no longer required.
  - Storage space for forensic evidence should be sufficient. In particular, the FSS should ensure that it has adequate secure storage for high risk or valuable items.
  - The FSS should maintain a central record of contamination incidents to help identify any patterns of error and to record confirmation that corrective actions have been undertaken.
  - Security procedures set out in the Quality Management System should be followed consistently, and compliance monitored routinely and spot checked as part of security audits.
  - Security breaches should be communicated to a security officer responsible for security across the FSS, to enable patterns to be identified and countermeasures to be devised and implemented.

# Part 1: Introduction

## The Forensic Science Service

**1.1** The purpose of the Forensic Science Service (FSS) is to serve the administration of justice, primarily the law enforcement agencies in England and Wales, by providing:

- impartial scientifically based evidence to support the investigation of crime; and
  
- expert evidence of opinion and fact to the courts.

The FSS's Chief Executive is the Forensic Science Advisor to the Home Secretary.

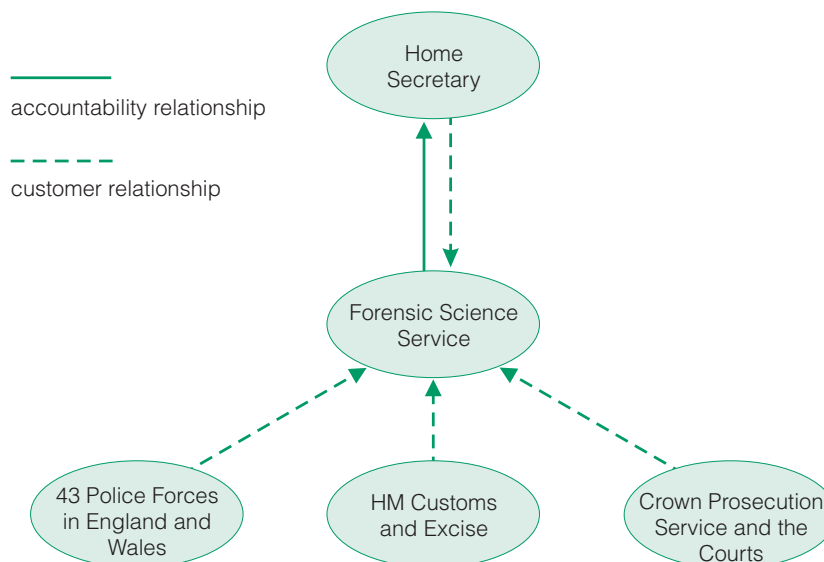
**1.2** The FSS is an executive agency of the Home Office (Figure 2). Its laboratories are based on six sites in Birmingham, Chepstow, Chorley, Huntingdon, London (the former Metropolitan Police Forensic Science Laboratory which merged with the FSS in 1996) and Wetherby. A seventh site, Aldermaston, was closed in March 1997. Operating costs, amounting to around £56 million in 1997-98, are required to be recovered in full through direct charges to customers.



Police staff submit items of forensic evidence to an FSS laboratory

**The Forensic Science Service and the Criminal Justice System**

**Figure 2**



The FSS's main customers are the 43 police forces in England and Wales and HM Customs and Excise for whom the FSS provides scientific support in the investigation of crime. The FSS gives expert opinion in court on behalf of the Crown Prosecution Service and undertakes work for the defence. The Home Office is also a customer, for example for research and development.

The Forensic Science Service is an executive agency of the Home Office. The Chief Executive of the FSS is the Forensic Science Advisor to the Home Secretary, and is accountable for the effective and efficient management of the FSS and for achieving the targets set out in its plans.

The Home Secretary appoints the Chief Executive, determines the policies within which the FSS operates, and approves the annual corporate plan and business plan. The Home Office is responsible for monitoring the performance of the FSS and advises the Secretary of State about performance through an Advisory Board with internally and externally appointed members.

Source:  
Forensic Science Service

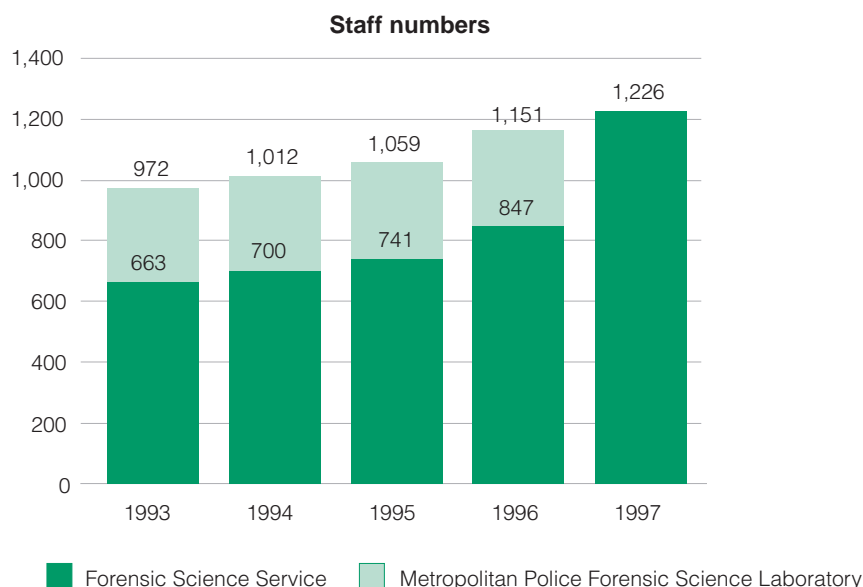
**1.3** At March 1997, the FSS employed over 1,220 staff (Figure 3), an increase of 26 per cent on the number employed by both the FSS and the Metropolitan Police Forensic Science Laboratory in March 1993. Some 80 per cent of staff are engaged on casework, the majority of whom are qualified and experienced scientists. The remainder are engaged in corporate functions such as research, business development, training, finance, personnel, site services and administration.

**1.4** Figure 4 (on foldout page) illustrates the forensic science process. The forensic scientist assists investigating authorities, mainly the 43 police forces in England and Wales and the investigative and enforcement arms of HM Customs and Excise. The FSS provides expert evidence in court to assist the Crown Prosecution Service in the prosecution of offenders, and undertakes a limited amount of work in support of the defence.

**Growth in staff numbers  
1993 to 1997**

**Figure 3**

*Between 1993 and 1997 staff numbers have increased by 26 per cent.*



Notes: 1. Figures for 1997 include staff who formerly worked for the Metropolitan Police Forensic Science Laboratory.

Source:  
Forensic Science Service

2. Staffing figures as at 31 March each year.

**1.5** The work of the forensic scientist entails examination of physical evidence involved or transferred in the course of a crime being committed, such as a knife, broken glass, fibres, hairs, footwear marks, bloodstains and other body fluids. Examples A, B, and C illustrate how the FSS assists in the investigation of crime. The laboratory-based work of forensic scientists includes routine testing of the blood samples of motorists to determine blood alcohol levels; analysis of DNA traces left at a crime scene to establish whether they match with a suspect’s DNA profile; examination of material from burnt-out buildings to determine whether the fire was caused by arson (Example D); testing of footprints to suspects’ shoe patterns or to footprints found at other scenes of crime; and comparison of glass fragments adhering to a suspect’s clothing with those from a broken window at the scene of a crime.

**1.6** Forensic examination of materials left at the scene of a crime is intended to substantiate whether a crime has been committed, or to corroborate suspicions by linking suspects to crimes, or eliminating them from an enquiry. Where a case concerns the death of an individual, the FSS does not seek to establish the time

**Scientists assist in the investigation of a theft from a vehicle**

**Example A**

The front passenger window of a car was broken and property taken. The police believed that the offenders entered and exited the car by climbing through the window. Two suspects were arrested 20 minutes later. The police submitted the jackets worn by the suspects and, in separate packaging, a control sample of broken glass from the vehicle to the FSS to establish whether there was any scientific evidence to support the allegation that the suspects had broken the car window and stolen property from inside. The scientist examined the suspects' jackets for the presence of glass fragments and compared the fragments found against the control glass sample from the car. The control sample consisted of pieces of toughened glass rarely encountered amongst others examined at that particular laboratory. The majority of the glass found on the suspects' clothing was indistinguishable from that of the broken vehicle window, and the findings therefore provided very strong evidence to support the allegation against the two suspects.

**Scientists analyse footwear marks found at the scene of a burglary**

**Example B**

At the scene of a burglary police found a partial footwear mark left on the window ledge through which access to the premises had been gained. Subsequently a woman was arrested and her training shoes seized. The suspect's shoes and an adhesive lift bearing the footwear mark found at the scene were submitted to the FSS to establish whether the shoes had made the mark. The scientist undertaking the analysis found the mark left at the scene corresponded to the sole pattern on the shoes including the general wearing of the sole. The scientist concluded that the possibility of finding another shoe which would match the mark to the same extent as the suspect's shoe was remote and therefore provided significant support for the view that the suspect's shoe had made the mark.

**Scientists attend the scene of a murder**

**Example C**

A woman was murdered in her home. FSS scientists attended the scene of the crime to assist the police in the collection and interpretation of forensic evidence. The version of events given by the suspects was not consistent with the scientists' interpretation of the distribution and pattern of bloodstaining left at the scene of the crime. Further forensic analysis of over 40 exhibits, including DNA analysis of blood stains, provided evidence to link bloodstaining at the scene of the crime with stains on the suspects' clothing. The suspects were convicted of murder.

**Scientists assist in the investigation of arson**

**Example D**

On examining the scene of a house fire, which endangered the occupant's life, the Fire Brigade found extensive burning of a wooden panel in the front door, below the letter box, which indicated that the fire had been started deliberately. Within two hours, the police had arrested a man suspected of being involved in the incident. His clothing, which had just been washed, a belt found in the kitchen and samples of the hallway carpet taken from the scene of the crime were submitted to the FSS to establish whether or not there were traces of fire accelerants present. By chemical analysis, scientists were able to detect a partially evaporated petrol-type hydrocarbon mixture on the carpet and on the belt. The clothing was not examined as the likelihood of detecting petrol had been considerably diminished by washing. By not undertaking unnecessary analysis, the FSS ensured police costs were minimised.

and mode of death. This is the role of forensic pathologists who are mostly members of pathology departments in medical schools or hospital consultant pathologists. In addition, the FSS does not normally analyse fingerprints found at scenes of crime. This is the responsibility of fingerprint officers employed by police forces.

**1.7** The FSS is not the only supplier of forensic science services in the United Kingdom. Figure 5 shows the main public and private sector providers of forensic science services. An increasing number of private sector organisations have competed for the growing market in forensic science services since the FSS became an executive agency in 1991 and police forces were given freedom to use any supplier. These organisations tend to focus on particular market niches, such as drugs analysis, toxicology services, document examination and DNA analysis, or

**Main public and private sector providers of forensic science services in the United Kingdom**

**Figure 5**

**Public sector providers**

Forensic Science Service	Provides services to the 43 police forces in England and Wales, the Crown Prosecution Service and HM Customs and Excise, and undertakes some work in support of the defence.
Scottish police laboratories	Police in Scotland are served by laboratories maintained by local police authorities in Glasgow, Edinburgh, Aberdeen and Dundee.
Forensic Science Agency of Northern Ireland	Based near Belfast, serving the Royal Ulster Constabulary.
Forensic Explosives Laboratory	Part of the Defence Evaluation and Research Agency, an Executive Agency of the Ministry of Defence, undertakes analysis of explosive devices and materials in mainland Britain.

**Private sector providers**

LGC (Laboratory of the Government Chemist)	Formerly a public sector organisation, provides a range of forensic science services including drug analysis, document examinations, DNA analysis and toxicology services to the private sector, the police and some government departments. LGC has recently acquired University Diagnostics Limited, which provides DNA analysis services to the public and private sectors and to the defence.
Other organisations	There are a large number of other private sector suppliers, including universities who normally operate through independent subsidiaries.

Source: National Audit Office

on a particular market sector, such as providing advice to defence solicitors. However, the FSS told us that some private sector providers are preparing to provide a full range of forensic science services to customers in the private and public sectors from early 1998.

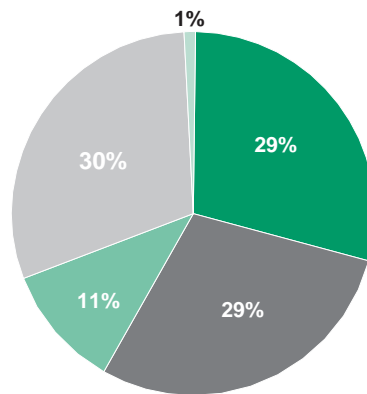
### Workload and customers

**1.8** Around 90 per cent of the caseload of the FSS is split evenly between the drugs, volume crime and analytical services business areas; of the remainder, most relates to serious crime (Figure 6). Serious crime cases often involve

**Cases handled by the Forensic Science Service, 1996-97**

**Figure 6**

*The services provided by the FSS cover a range of criminal offence categories.*



Business Areas	Number of cases submitted
<b>Drugs</b> , for example, possession, supply of controlled drugs	26,160
<b>Volume crime</b> , for example, burglary, criminal damage	25,454
<b>Serious crime</b> , for example, murder, rape, wounding and grievous bodily harm	9,632
<b>Analytical services</b> covering offences such as driving after consuming alcohol/drugs and importation/exportation offences	26,507
<b>New law enforcement</b> covering UK public/private sector and international work, for example, workplace drug screening and video enhancement services	1,330
	<hr/> 89,083

Source:  
Forensic Science Service



extensive forensic work, and around one fifth of staff work on serious crime; a further fifth undertake work on DNA analysis, most of which relates either to serious crime or to volume crime.

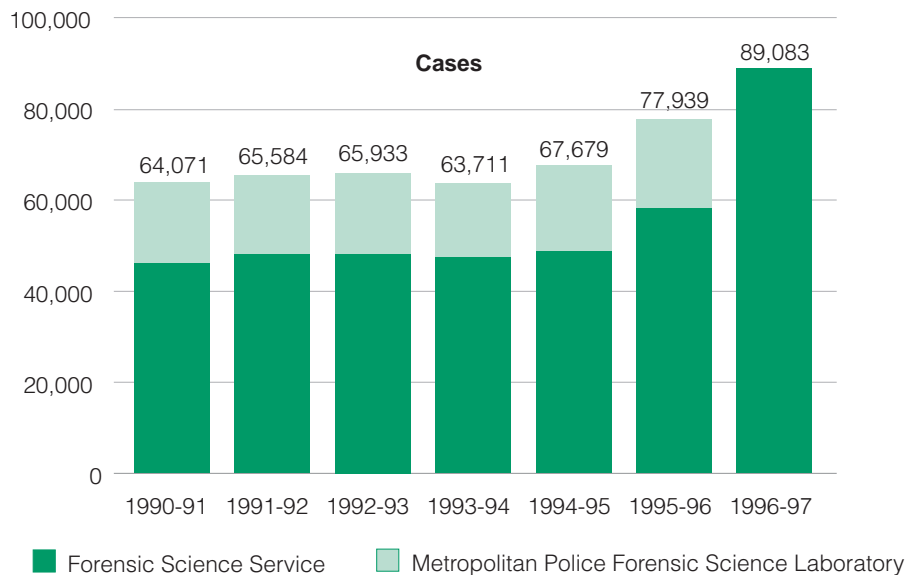


**1.9** During 1996-97, nearly 90,000 cases were submitted to the FSS. This represents a 39 per cent increase over the six years since 1990-91, comparing the number of cases handled by the new national organisation with those handled by both the old FSS and the Metropolitan Police Forensic Science Laboratory, prior to their merger in April 1996 (Figure 7).

**Growth in caseload  
1990-91 to 1996-97**

**Figure 7**

*Since acquiring executive agency status in 1991 the number of cases handled by the FSS and, prior to April 1996, the Metropolitan Police Forensic Science Laboratory has increased by 39 per cent to almost 90,000 cases.*



Notes: 1. The caseload figures include those cases where DNA samples are taken from scenes of crime for inclusion on the National DNA Database but exclude the large volume of work involved in processing suspect samples also for inclusion on the Database.

2. Metropolitan Police Forensic Science Laboratory caseloads between 1990-91 and 1993-94 are for the calendar year.

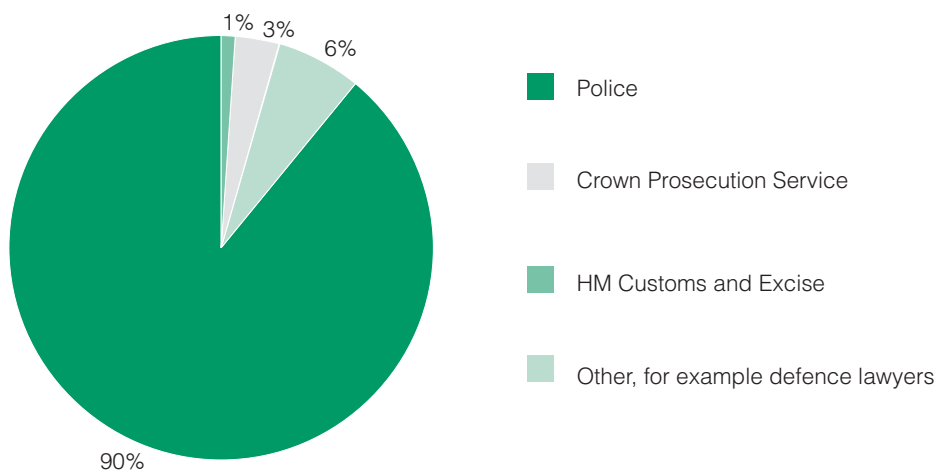
Source:  
Forensic Science Service

Some 90 per cent of the FSS's income is derived from services provided to the police. Most of the remainder comes from the Crown Prosecution Service and HM Customs and Excise (Figure 8).

**Income by customer  
in 1996-97**

**Figure 8**

*Police forces accounted for 90 per cent of FSS income in 1996-97.*



Source:  
Forensic Science Service

## **Development and organisation of the FSS**

**1.10** In recent years, the FSS has been subject to major changes which have had a significant impact on its organisation (Figure 9). In 1991, the FSS became an executive agency of the Home Office. This change in status, and the replacement of direct funding from the Home Office with direct charging of customers for services provided, has required the FSS to make major changes in its organisation in order to adapt to a more commercial environment, and respond to the evolving needs of the criminal justice system. The FSS spends about six per cent of its resources on research and development and a further six per cent on other business development.

**1.11** In 1995 the National DNA Database was launched for which the FSS is custodian and the main supplier of DNA analysis. Example E on page 19 shows how the National DNA Database can assist the police in the investigation of a

**Stages in the development of the Forensic Science Service**

**Figure 9**

Local police laboratories	Establishment of local police laboratories in the 1930s.
Home Office Forensic Science Service established (1966)	Development of scientific techniques and increasing use of forensic science in investigating crime were key factors leading to the amalgamation of local police laboratories into larger centres and the establishment of the Home Office Forensic Science Service in 1966.
Forensic Science Service becomes an executive agency and direct charging introduced (1991)	By the 1980s the FSS was unable to cope with increased demand for its services. The Home Office Select Committee <sup>1</sup> recommended that in order to address the imbalance between supply and demand, police forces should pay according to the use they made of the FSS. In 1991, central funding of the FSS was replaced by direct charging for services. In the same year, the FSS was given executive agency status and introduced a corporate quality management system which gained accreditation to BSI ISO 9001 standards and the United Kingdom Accreditation Service in 1993.
Implementation of the National DNA Database (1995)	Following legislation to allow the cross matching of DNA samples taken from suspects and known criminals, the FSS launched, in partnership with the Association of Chief Police Officers, the world's first National DNA Database. The launch of the Database dramatically increased the demand for DNA analysis.
Merger with Metropolitan Police Forensic Science Laboratory and reorganisation of service provision (1996)	The FSS merged with the Metropolitan Police Forensic Science Laboratory in April 1996 to create a new national service. The FSS also reorganised the way it provided its services, principally through a new product based charging system, and by refocusing operations into national business areas, for example serious crime and volume crime.
Closure of Aldermaston Laboratory (1997)	Following a rationalisation review, the Aldermaston site was closed.

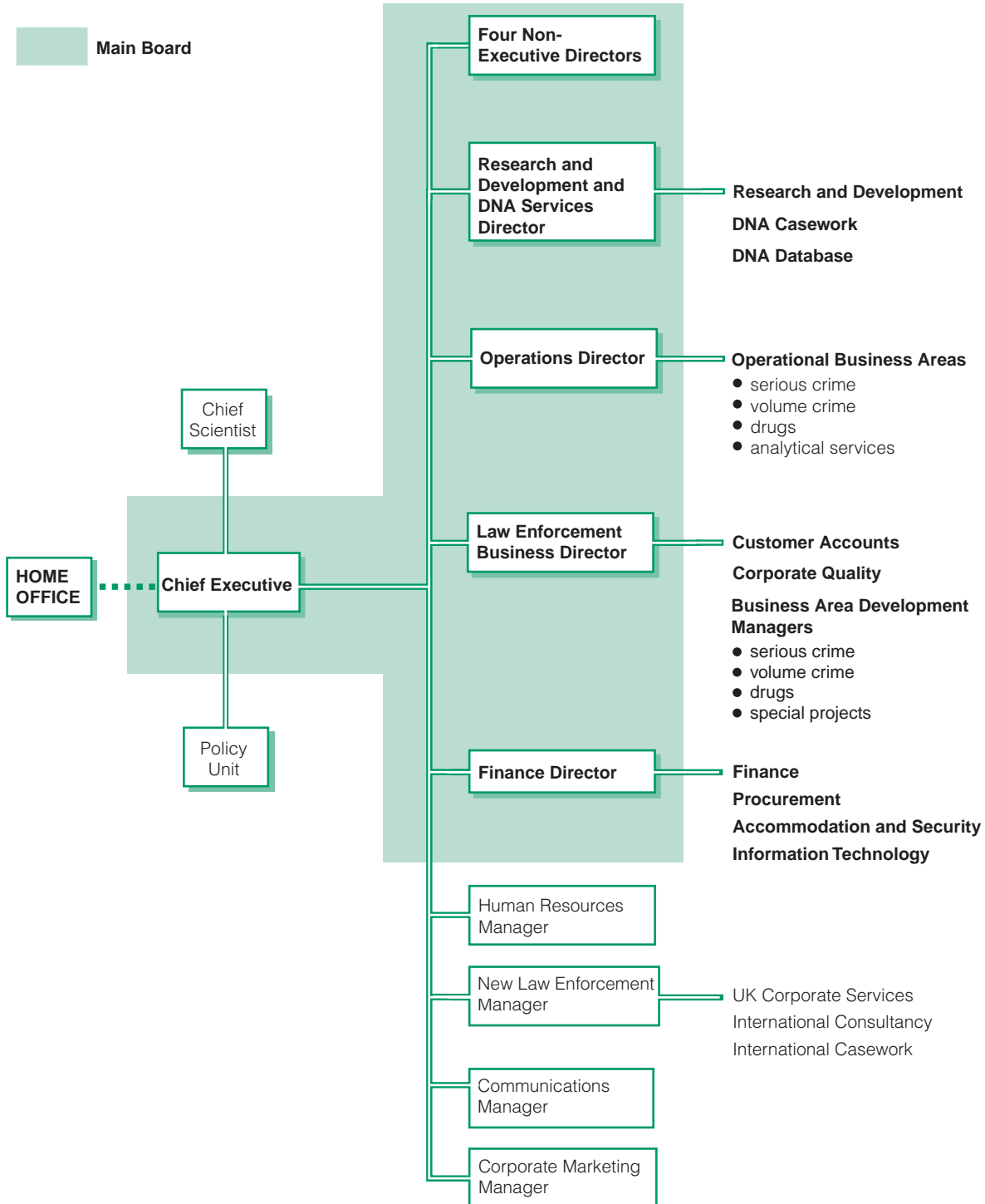
Source: National Audit Office

Note: 1. Report on the Forensic Science Service, HC 26, Session 1988-89

crime. Potential uses for DNA technology, and consequently the demand for DNA services, have increased significantly in recent years. In April 1996, the Metropolitan Police Forensic Science Laboratory was merged with the FSS to create a new national Forensic Science Service. Also in 1996, the FSS was reorganised in order to distinguish more clearly the responsibilities for its core business areas and customers. Figure 10 shows the organisation structure of the

**Figure 10**

**Organisational structure of the Forensic Science Service at January 1998**



Note: Important aspects of management control in the FSS are exercised through the three main management committees which are the Executive Committee, the Corporate Quality Committee and the Audit Committee. The responsibilities and memberships of these committees are shown in Appendix 1.

Source: Forensic Science Service

**Scientists assist in linking a series of computer thefts through the National DNA Database**

**Example E**

Following the theft of £85,000 worth of computer equipment from a company in Devon three suspects were arrested by the police. Mouth swabs were taken from the suspects and submitted to the FSS to obtain DNA profiles from the men's saliva. Scientists were able to link one of the suspects to the scene of the crime by matching his profile with DNA evidence found at the scene. When the same suspect's profile was put on to the National DNA Database, matches were also found to samples taken from the scenes of crime of eight unsolved computer chip thefts from companies in the counties of Devon and Cornwall, Gloucester, Hampshire, Kent and North Wales. The FSS calculated that the probability of a chance match was one in 75 million.

FSS, and Appendix 1 gives details of the three main management committees. As a result of the fundamental changes in the business environment and demands on the FSS since 1991, it now operates very differently from the organisation which existed in pre-agency days.

## Scope of this examination

**1.12** Our examination focused on the quality of service provided by the Forensic Science Service to its customers in the criminal justice system and how well the requirements of customers are met. We examined:

- whether the output provided by the FSS meets the needs of customers in the criminal justice system (Part 2 of this Report);
- whether the FSS has adequate systems and procedures in place to control and assure the scientific standards of forensic work (Part 3 of this Report); and
- whether the FSS has effective arrangements and procedures to ensure the safety and integrity of forensic evidence in its custody (Part 4 of this Report).

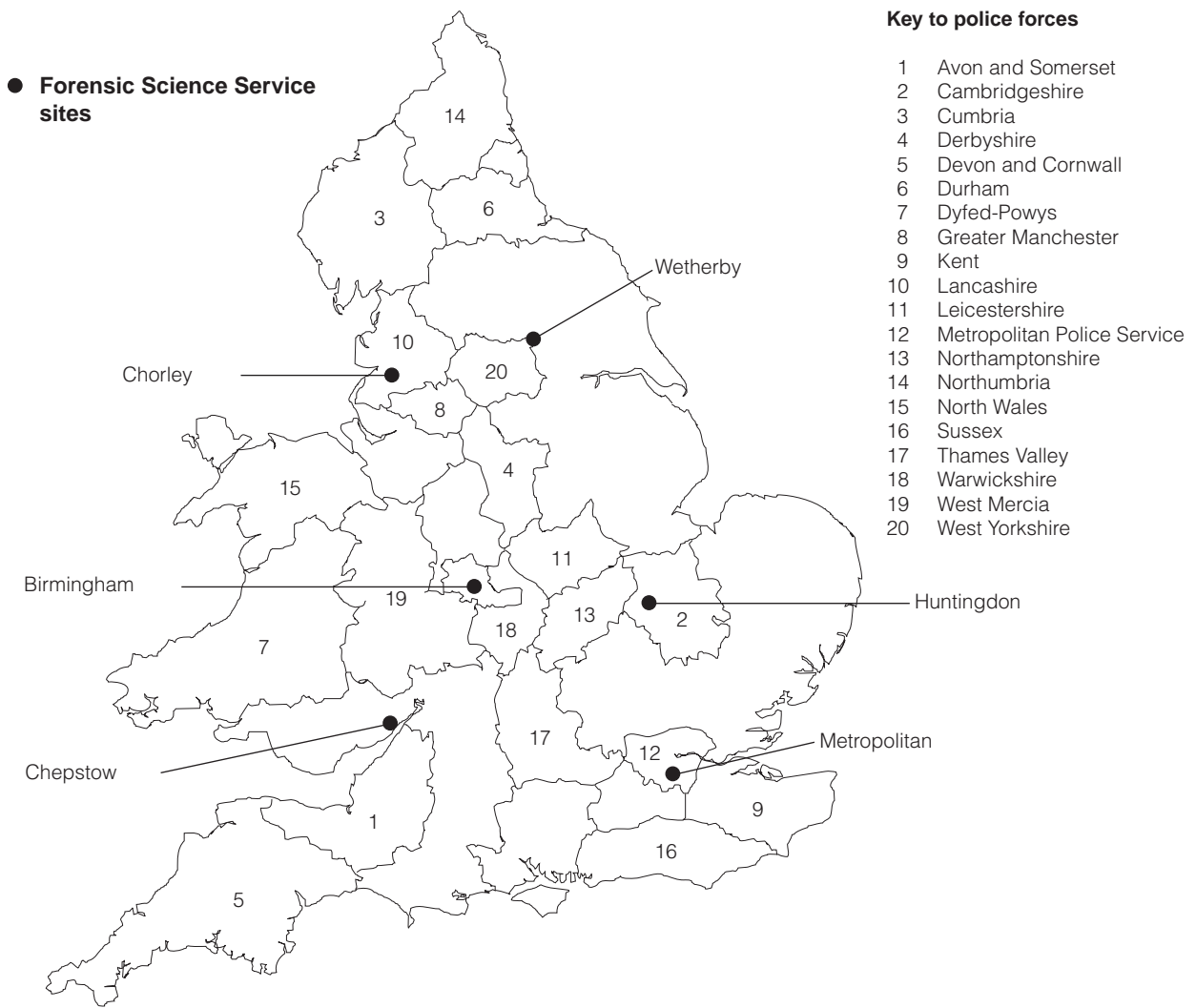
## Study methodology

**1.13** Our study method comprised:

- analysis of a representative sample of FSS cases (Appendix 2);
- visits to all six FSS sites (Figure 11);
- seeking the views of customers about the services by:
  - a questionnaire survey (Appendix 3) of 20 police forces in England and Wales (Figure 11), undertaken in collaboration with the Audit Commission;

**Figure 11**

**Map showing the main sites of the Forensic Science Service and the police forces surveyed**



- discussions with other customers and customer representatives (the Association of Chief Police Officers, HM Customs and Excise, the Crown Prosecution Service and the Home Office);

- a review of the results and conclusions from the customer surveys commissioned by the FSS every two years since 1993;
  - analysis of information from the FSS's management information system;
  - review of the integrity of procedures for assuring the standards and scientific quality of the FSS's work;
  - review of security systems and procedures; and
  - a reference panel of people with relevant experience and representing the main parties with an interest in the work of the FSS, who were consulted in the course of this examination (Appendix 4).

## Part 2: Meeting the needs of customers

**2.1** The aim of executive agency status and the introduction of charging in April 1991 was to balance supply and demand and promote a better focus on customer requirements by the FSS. By charging customers for services, they are encouraged to articulate their requirements by considering more closely the value and effectiveness of forensic support. The FSS was restructured in 1990 to support these changes. Further restructuring in 1996 into business areas focused the FSS more effectively on the needs of customers, primarily the police (paragraph 1.11). This part of the report examines:

- the contribution of the FSS to the criminal justice system;
- customer satisfaction with the service provided;
- the speed of delivery of forensic science analysis to customers; and
- the adequacy of communication between the FSS and its customers.

### Contribution to the criminal justice system

#### *Main findings*

---

Forensic science plays an increasingly important role in the investigation and prosecution of crime. The police and the Crown Prosecution Service consider that the FSS makes a significant contribution to the needs of the criminal justice system. FSS forensic reports generally meet customer needs and are readily understandable by users, in particular the Crown Prosecution Service. The FSS is actively shaping its organisation, developing products and rearranging administrative processes to meet the needs of customers.

FSS scientists are required to assess how far their work is helping to further investigations. Although the criteria for assessing cases are clearly set out, some cases are not assessed and it is not clear why this is so. Over half of the cases which are assessed are judged to provide strong or conclusive evidence to advance an investigation. Police forces undertake similar monitoring of cases separately, but the results are not shared.

---

#### **Use of the FSS**

**2.2** Forensic science is used in many different ways, ranging from routine testing of the blood samples of motorists, to complex analysis of many items from the scene of a serious crime, and to mass screening of individuals. Recent developments such as DNA analysis have resulted in forensic evidence playing an increasingly important role in the investigation of crime and the prosecution of offenders. The number of cases dealt with by the FSS (including cases from the former Metropolitan Police Forensic Science Laboratory) has increased by nearly



40 per cent since 1990-91 (Figure 7). Much of this increase has taken place since April 1995 when the National DNA Database was launched. Since 1994-95, there has been a 32 per cent increase in caseload.

**2.3** Our survey of 20 police forces found that all of those forces who provided an assessment considered the contribution of the FSS to decisions on whether to eliminate, charge or arrest suspects to be very significant or significant in those cases in which it is involved (Figure 12). This view was confirmed in discussion with the Crown Prosecution Service.

**2.4** The proportion of all crime investigations in which FSS services are used is small, some 1.7 per cent of all notifiable offences recorded by the police in England

**Contribution of forensic science to investigation of crime by police forces**

**Figure 12**

*All forces providing an assessment considered that the FSS's contribution was significant or very significant to their decisions on whether to eliminate, arrest or charge suspects for an alleged crime.*

<b>Forces' assessments of the significance of forensic science contribution to police decisions on crime investigations</b>					
<b>Decision</b>	<b>Very significant</b>	<b>Significant</b>	<b>Not significant</b>	<b>No assessment</b>	<b>Total forces</b>
eliminating suspect(s)	7	8	0	5	20
arresting suspect(s)	7	8	0	5	20
charging suspect(s)	6	9	0	5	20
overall assessment (per cent)	20 (33%)	25 (42%)	0 (0%)	15 (25%)	

Source: National Audit Office survey of 20 police forces

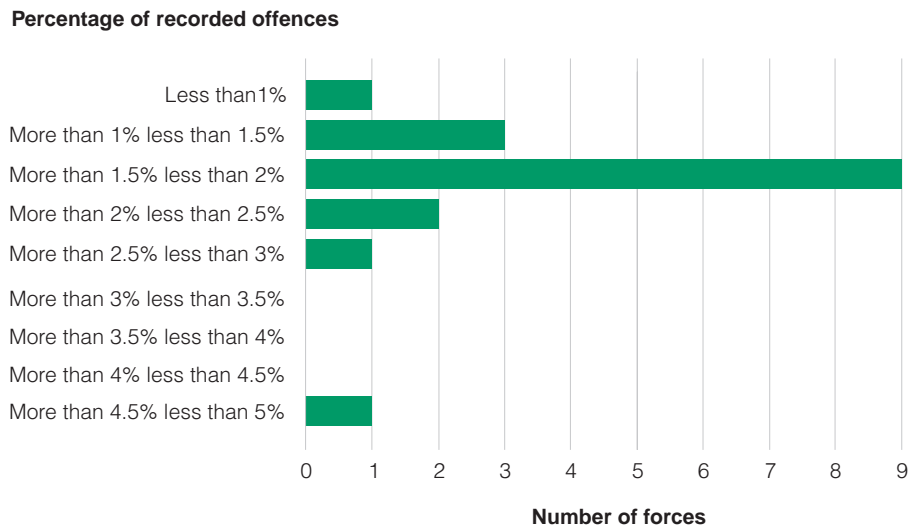
and Wales in 1996. However, forensic science contributes to a greater proportion of investigations of serious crimes. For example, for offences of violence against the person, including murder and attempted murder, sexual offences, and assault, the FSS estimates that in 1996 police forces submitted items for forensic scientific analysis in about 10 per cent of investigations. In very serious cases such as homicide, forensic submissions are made in almost all cases. Forensic science is also used in the investigation of repeat offenders in volume crime such as burglary and vehicle theft, with the purpose of establishing a pattern of offending in a

particular area. Our survey of police forces showed that most made submissions of items for scientific analysis to the FSS for between 1.5 per cent and 2 per cent of the recorded crimes in their area (Figure 13).

**Proportion of recorded offences in 1996-97 generating forensic submissions in the forces surveyed**

**Figure 13**

*Most of the forces surveyed submit items for examination by the FSS for between 1.5 per cent and 2 per cent of the recorded crimes in their area.*



Source: National Audit Office survey of 20 police forces

Note: Three forces were unable to provide data about the proportion of recorded offences which generated forensic submissions.

**2.5**

The survey found that the capability of the FSS to meet police requirements in the investigation of crime is the most important criterion given by forces in deciding whether to use FSS services. Cost is of less importance in the initial decision to use FSS services in investigating a crime (Figure 14). However, the FSS is not a monopoly supplier of forensic services (paragraph 1.7 and Figure 5). Among the police forces surveyed, expenditure on non-FSS suppliers as a proportion of total spending on forensic science services ranged from zero to nearly nine per cent. Forces were using suppliers other than the FSS to undertake work on cases where they perceived that costs and/or timeliness might be a problem if the work was given to the FSS or where the FSS was unable to provide the analysis required (Figure 15).

**2.6**

Most of the cases we examined were concluded with a forensic report, normally in the form of a witness statement, which communicated the results of the FSS's analysis. The reports addressed the question or questions posed by the

**Reasons why police forces use the services of FSS**

**Figure 14**

*The capability of the FSS to meet requirements is the most important criterion for the police in deciding whether to use FSS services for both corroborative and intelligence purposes; the cost of FSS services is of less importance to the police.*

Reasons	Corroborative purposes <sup>1</sup>	Ranking		Intelligence purposes <sup>2</sup>
Capability of FSS's analysis to meet the force's requirement	1			1
Seriousness of crime	3			2
Integrity of exhibits preserved	2			4
Availability of in-house expertise	4			3
Cost of forensic services/budget availability	5			5
Other	6			6

Source: Averaged rankings taken from National Audit Office survey of 20 police forces

Notes: 1. to provide evidence linking a suspect to a crime or eliminating a suspect from the enquiry  
2. to link crime scenes where no suspect has been identified

**Reasons why police forces use suppliers of forensic science services other than FSS**

**Figure 15**

*Cost, timeliness and inability of the FSS to provide certain types of analysis are the most important reasons given by police forces for using suppliers other than the FSS.*

<b>More important:</b>	<ul style="list-style-type: none"> <li>Cost</li> <li>Timeliness</li> <li>FSS unable to supply analysis</li> </ul>
<b>Less important:</b>	<ul style="list-style-type: none"> <li>Reliability</li> <li>Effectiveness</li> <li>Scientific quality</li> </ul>

Source: National Audit Office survey of 20 police forces

customer commissioning the analysis, and were clearly written, indicating how far the results were conclusive. The police and the Crown Prosecution Service considered FSS forensic reports to be generally of a good standard and readily understandable.

**2.7** The FSS does not routinely provide statements to the police on DNA samples taken from scenes of unsolved crimes. Feedback is confined to confirmation that a DNA profile has been successfully extracted and that it has been passed to the National DNA Database. Our survey of police forces revealed some dissatisfaction that no “no match” reports were given after the profile was cross matched against the Database. Only positive matches are reported routinely, as agreed between the FSS and the Association of Chief Police Officers. Some police forces felt that an initial “no match” report would further their investigation, although continuous searching of the Database can produce positive matches at a later date as new profiles are added.

### **Assessing the effectiveness of FSS work**

**2.8** The FSS has attempted to assess how far its work is helping the police to further their investigations. On completion of work for serious crime, volume crime and analytical services cases, FSS scientists are required to score effectiveness from a scientific viewpoint in terms of the extent to which forensic analysis was conclusive in supporting or refuting the link between evidence and the suspect. The rating is on a scale of one to seven. A rating of one applies where results of scientific analysis conclusively eliminate a suspect from the scene of the crime; and a rating of seven is given where the results conclusively associate a suspect with the crime scene. A rating of four indicates that the results of analysis were inconclusive.

**2.9** The FSS effectiveness scores for the cases we examined are at Figure 16. Drugs cases are routinely not scored, because the results are usually clear (i.e. the material is either a drug or it is not) and the analysis relatively straightforward. Although the criteria for assessing cases are clearly set out, we found that a further 31 per cent of serious crime, volume crime and analytical services cases had not been scored, but it was not clear why this was so. For those cases that had been scored 55 per cent had provided strong or conclusive evidence to associate a suspect with the scene of crime or to eliminate the suspect. Nearly one third of cases were inconclusive.

**FSS effectiveness scores for a sample of serious crime, volume crime and analytical services cases**

**Figure 16**

*For those cases in the National Audit Office sample which had been scored, **55 per cent** were rated as providing strong or conclusive evidence to associate the suspect with the scene of the crime or to eliminate the suspect from the enquiry. In **30 per cent** of cases evidence was considered to be inconclusive.*

Effectiveness rating	Serious <sup>1</sup> Crime	Volume <sup>1</sup> Crime	Analytical <sup>1</sup> Services	Total	Percentage of those scored
1. Conclusive evidence to eliminate a suspect from the scene of the crime	1	2	-	3	<b>3</b>
2. Strong evidence to eliminate a suspect	-	2	-	2	<b>2</b>
3. Some evidence to eliminate a suspect	1	-	-	1	1
4. Inconclusive evidence	8	18	2	28	<b>30</b>
5. Some evidence to associate a suspect with the scene of the crime	4	8	1	13	14
6. Strong evidence to associate a suspect	9	9	-	18	<b>20</b>
7. Conclusive evidence to associate a suspect	2	24	2	28	<b>30</b>
<b>Total scored</b>	<b>25</b>	<b>63</b>	<b>5</b>	<b>93</b>	<b>100</b>
Not scored	14	21	6	41	
<b>Total</b>	<b>39</b>	<b>84</b>	<b>11</b>	<b>134<sup>2</sup></b>	

Source: FSS effectiveness scores for 134 serious crime, volume crime and analytical services cases examined by the National Audit Office

Notes: 1. Definitions for these headings are given in Figure 6.  
2. Excludes drugs cases (82 cases) as these are not routinely scored.

**2.10** The level of inconclusiveness ratings can be affected by the quality and type of submissions made by customers, and by the appropriateness of the tests or analysis undertaken. The FSS's processes and procedures are designed to reduce the likelihood of an inconclusive outcome. For example, the FSS offers "preview" services to customers whereby the scientist fully reviews a forensic submission

before testing to establish whether full scientific analysis is likely to be of value to the investigation. This reduces the risk of customers having to pay for tests which are unlikely to give conclusive results.

**2.11** In 1997, the FSS began monitoring the number of inconclusive cases in the volume crime business area. Using the data available for the first quarter of 1997, the FSS assessed that around one fifth of its volume crime work was providing inconclusive evidence. The assessment highlighted variations in performance across the FSS's



laboratories, and differences in police forces' evidence collection and submission practices. For example, one police force was found to be concentrating almost exclusively on footwear and glass submissions. The FSS used the force's data on submissions as a basis for discussions with them to seek ways of improving submissions and to demonstrate how analysis of other items such as fibres could provide useful scientific results. The FSS extended similar reviews of the effectiveness scores to the serious crime business area at the end of 1997.

**2.12** The FSS does not routinely receive customer feedback about the usefulness of its work on individual cases. The police scientific support manager and the officer in the case normally make a separate assessment of the usefulness of forensic analysis for each case, but this information is not normally provided to the FSS. We examined the assessments of the police scientific support managers for the same sample of cases used to establish FSS effectiveness scores (paragraph 2.9). This showed that in police assessments of 105 cases involving serious crime, volume crime or analytical services cases, the police forces judged FSS input to be useful or very useful in 67 per cent of cases (Figure 17). In almost all cases involving the analysis of drugs (82 cases), the police scored the FSS's work as very useful.

**2.13** For 76 of the 134 serious crime, volume crime and analytical services cases we examined, the FSS and the police scientific support managers had both provided an effectiveness score. We compared these scores and found that in nearly 90 per cent of cases the police rated the FSS's work the same or better than the FSS rating, indicating that the FSS may be understating the contribution of its scientific analysis to police investigations.

**Police assessments of the effectiveness of FSS's work for a sample of cases**

**Figure 17**

*The police rated a substantial proportion of FSS work as effective; in 67 per cent of serious crime, volume crime and analytical services cases the police assessed the FSS's contribution as useful or very useful.*

Police rating of FSS work	Serious Crime	Volume Crime	Analytical Services	Total	Percentage of those scored
1. Very useful	13	31	6	50	<b>48</b>
2. Useful	9	10	1	20	<b>19</b>
3. Limited use	2	8	-	10	9
4. No evidential value	6	16	3	25	24
<b>Total scored</b>	<b>30</b>	<b>65</b>	<b>10</b>	<b>105</b>	<b>100</b>
Not scored	9	19	1	29	
<b>Total</b>	<b>39</b>	<b>84</b>	<b>11</b>	<b>134</b>	

Source: Records of police effectiveness scores for 134 cases examined by the National Audit Office

Note: Figures 16 and 17 show equivalent information on the respective scoring systems of the FSS and the police for the same sample of cases. Drugs cases are excluded because there is no equivalent scoring by the FSS.

**2.14** There is scope for the FSS to make better use of its effectiveness assessments by taking account of the equivalent customer assessments made by police scientific support managers and officers in the case. This analysis would add to the FSS's understanding of how it performs, would help to identify improvements, and could feed into joint work being done by the police and the FSS to assess the effectiveness of forensic science, such as the project recently launched by the Association of Chief Police Officers' Crime Committee to review and develop outcome related performance indicators on the contribution of scientific support.

**2.15** The FSS is taking other steps to improve the effectiveness and cost-effectiveness of the service it provides to customers and to establish constructive relationships with the police. In 1996, the FSS further rationalised its service delivery and restructured into business areas with the intention of becoming more customer focused. New roles were created within the FSS to

improve communication, to help maximise the contribution of forensic science to the criminal justice system, to liaise regularly with customers to help them determine their requirements, and to facilitate the development of new FSS products and services. These new roles were still developing at the time of our examination.

**2.16** In April 1996, the FSS replaced standard charging by item submitted with product-based pricing. Each product, such as a body fluid search, a tool mark examination or a cannabis identification, is defined by a standard set of forensic activities. The whole process is then costed to give a price more closely related to actual work performed, thus providing customers with a better understanding of the true costs of services and enabling them to make informed judgements about their value.

## Customer satisfaction

### *Main findings*

---

The FSS has systems in place to measure customer satisfaction. Customers are generally satisfied with the service provided, and the large majority consider that the service is improving. However, they consider that the FSS could do more to improve the speed of delivery. Recorded complaints relate to a very small proportion of workload but are likely to be understated.

---

### Customer surveys

**2.17** The FSS seeks the views of its police customers every two years using a questionnaire survey. The 1993 and 1995 surveys found that customers were generally satisfied with the service provided which they felt had improved, but they thought that the FSS could do more to improve further the speed of delivery, value for money and communication. The FSS's 1997 survey indicates that the FSS has improved its service but that timeliness remains a concern (Figure 18).

**2.18** Our survey of 20 police forces covered the extent of information which forces provide with the items submitted for examination; the extent and nature of communication with the FSS; and the timeliness and the usefulness of its work. The survey was designed to explore in more depth some of the responses given by police forces to the FSS survey, for example by identifying the significance of the FSS's contribution to criminal investigations (Figure 12); the reasons for using or not using FSS services (Figures 14 and 15); and suggestions for improvements in the service provided. Ours and the FSS's own surveys produced no conflicting findings.



**FSS customer  
satisfaction survey**

**Figure 18**

*While customers are broadly satisfied with the service provided, the turnaround times for routine cases remain a concern.*

**Percentage of respondents holding the view**

<b>Customer view</b>	<b>1995</b>	<b>1997</b>	<b>change</b>
Standard of service quite good or better	92	93	+1
Standard of service very good or excellent	50	53	+3
Standard of service improving	55	69	+14
Standard of service improving a lot	12	22	+10
FSS offers a good range of services	65	72	+7
Turnaround times good in routine cases	51	49	-2
Turnaround times good in urgent cases	85	83	-2

Source:  
FSS 1995 and 1997 customer  
surveys of police forces

**2.19** In July 1996, the FSS was awarded the contract to provide forensic science services to HM Customs and Excise. The analytical services provided are generally the same as those provided to the police, for example drugs testing, tool mark examinations, DNA profiling and fibre examinations. HM Customs and Excise considered that its contract with FSS was still bedding in, but had so far been satisfied with the level of service and impressed with the efforts to put things right. During the first year of the contract, the FSS had met 86 per cent of delivery date targets.

**2.20** The Crown Prosecution Service considered that the use of forensic analysis as key prosecution evidence in court had increased. The service provided by the FSS was consistently high, particularly the usefulness of witness statements and the performance of FSS experts in court. The Crown Prosecution Service was very satisfied with communication with the FSS and praised the information and training provided, for example on the application of new forensic techniques such as DNA testing. There was some concern, however, about recent performance in meeting delivery dates, particularly in view of the increasing importance of forensic evidence in court, the Crown Prosecution Service's obligations to review cases quickly and comply with statutory time limits and, in the future, the additional statutory time limits proposed in the Crime and Disorder Bill.

## Complaints

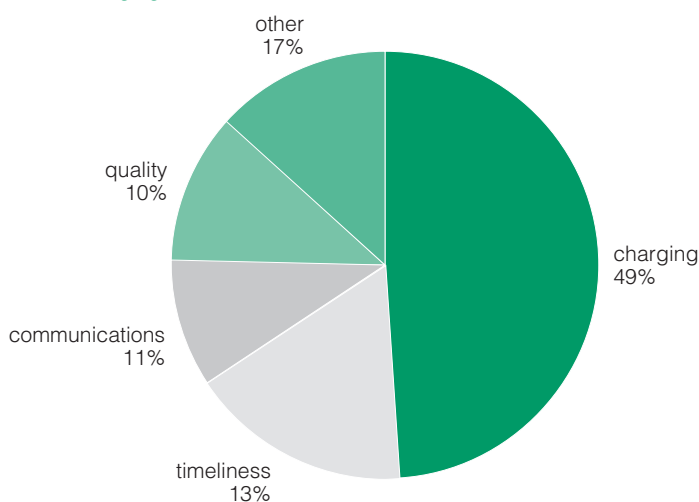
**2.21** Another indicator of customer satisfaction is the number and nature of customer complaints. It is the FSS’s policy to record, investigate and take action on all complaints. We examined the records of complaints at each of the sites visited. During 1996-97, there were 240 recorded complaints, representing a very small proportion of the FSS’s workload, about 0.26 per cent. However, recorded complaints are likely to understate the actual position because complaints to the Metropolitan Laboratory in the first six months of 1996-97 and complaints about Aldermaston for the last six months of the year, prior to its closure, had not been included; and complaints about DNA work were not consistently recorded as official complaints. We also noted that Chepstow and Wetherby received over 60 per cent of the recorded complaints. This either suggests under-recording of complaints by the other sites or the existence of particular problems at Chepstow and Wetherby.

**2.22** Half of recorded complaints received in 1996-97 related to charging, for example errors in invoice calculations and charges being attributed to the wrong customer (Figure 19). Some 13 per cent related to timeliness. For example, one particular complaint concerned a case submitted in October 1996 where the FSS failed to meet its target for completing the work by December 1996, and the police

**Customer complaints in 1996-97**

**Figure 19**

*During 1996-97, there were 240 recorded complaints (0.26 per cent of FSS workload), nearly half of which related to charging.*



Note: "Other" includes, for example, complaints about the content of witness statements produced by the FSS.

Source: Forensic Science Service

force did not receive the witness statement until March 1997. As a consequence, the suspect had to be bailed three times. Some 11 per cent of complaints related to communications, mainly delivery notes and witness statements not being received by customers. Only ten per cent of complaints related to the quality of casework. For example, in one case the police complained that the laboratory had failed to find a patch of blood on a jacket submitted in a murder investigation.

## Speed of delivery

### *Main findings*

---

Delays in examining forensic evidence can hinder police investigations, and so timeliness is a key issue for customers. There are wide variations in the standard target delivery times of the FSS's six laboratories. The FSS is in the process of setting common target times, and monitors performance across the laboratories.

The FSS has reduced turnaround times for casework significantly in recent years. It achieved the key target to meet 90 per cent of delivery dates agreed with customers in 1994-95, and again in 1995-96, but in 1996-97 only 81 per cent of all casework was completed within delivery dates against the 90 per cent target (Figure 1). The main elements of the shortfall related to DNA work, and to the lower performance levels of the Metropolitan Laboratory, formerly the Metropolitan Police Forensic Science Laboratory, which merged with the FSS in 1996. The Metropolitan Police Service considered that the difference in performance had arisen from the historical requirement for the single laboratory to provide a full service to the Metropolitan Police and to respond to a different crime mix, especially in relation to terrorist cases.

The FSS is at the forefront of technological developments in the provision of forensic science, most recently in the development and implementation of DNA analysis to support crime investigation and in processing high volumes of DNA samples for the National DNA Database. Senior police officers consider that the introduction of DNA techniques has been comparable to the advent of fingerprints in terms of its impact on the use of forensic science in crime investigations and on the outcomes of investigations. The National DNA Database, of which the FSS is custodian and the principal supplier of analysis, was the first of its kind in the world and was implemented in April 1995. As at December 1997, the Database held information on some 250,000 suspect samples and 27,000 crime scene samples; and there had been over 20,000 matches of either a suspect to a crime scene or one crime scene to another.

The FSS has however experienced difficulties in processing the high volume of DNA samples submitted by police forces, particularly samples from suspects. This arose from a variety of factors including the time needed to introduce and prove the new technologies. Demand for the new service was hard to predict, and submissions from police forces continue to grow at a rate significantly above that originally forecast with the Association of Chief Police Officers. A backlog of crime scene samples was eliminated by autumn 1997. The backlog of the high volume suspect samples requiring inclusion on the National DNA Database currently stands at about 120,000. The FSS aims to eliminate this backlog by the end of 1998.

---

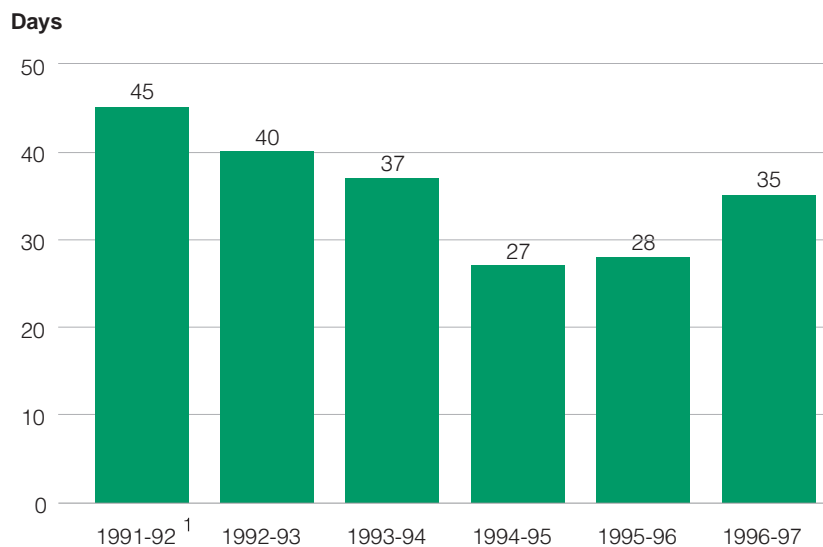
**2.23** The timeliness of the FSS’s work is important to customers. The potential consequences of the FSS missing deadlines agreed with its customers include suspects having to be re-bailed due to the non-availability of the forensic scientist’s report; the police not pursuing other lines of enquiry where forensic science analysis would lead them to eliminate a strong suspect; or, in certain limited circumstances, the charges being dropped. Police forces responding to our survey expressed concern about the speed of delivery of FSS work. The FSS acknowledges that timeliness is a key issue for customers and is seeking to improve performance.

**2.24** Average turnaround times for police business have nevertheless reduced significantly since 1991-92, by more than 22 per cent from 45 to 35 days (Figure 20). The more recent increases in turnaround times primarily result from delays in the analysis of DNA samples and from the inclusion of turnaround times for the Metropolitan Laboratory following the merger with the former Metropolitan Police Forensic Science Laboratory in 1996. Turnaround times have also increased because a greater proportion of the casework undertaken by the FSS involves the analysis of DNA which is a complex and time consuming process. The Metropolitan Police Service considered that the difference in performance between the Metropolitan Laboratory and the other FSS laboratories had arisen from the historical requirement for the single laboratory to provide a full service to

**Average turnaround times for FSS casework between 1991-92 and 1996-97**

**Figure 20**

*FSS turnaround times have reduced significantly since 1991-92 but in recent years have increased as a result of delays in processing DNA work and the merger with the Metropolitan Police Forensic Science Laboratory. If factors relating to the DNA work and the merger are excluded, the average turnaround time for police business in 1995-96 and 1996-97 was 19 days.*



Source: Forensic Science Service Annual Reports 1995-96 and 1996-97

Note: 1. October to March 1991-92

the Metropolitan Police and to respond to a different crime mix, especially in relation to terrorist cases. If factors relating to DNA work and the merger are excluded, the average turnaround time for police business in 1995-96 and 1996-97 was 19 days, a reduction since 1991-92 of 58 per cent.

**2.25** The FSS sets standard target delivery times for different offence types, although these can be varied by the customer for individual cases. The target delivery times for serious crimes such as murder or attempted murder are generally longer than those for less serious crimes (Figure 21), reflecting the number of items and the complexity of analysis usually involved in serious crime cases. In volume crime cases such as burglary, there may be fewer items and the police often need quick results to enable them to follow up lines of enquiry. The targets thus reflect the process of the crime investigation rather than the seriousness of the offence.

**Figure 21**

**Standard target delivery times at FSS laboratories for example categories of offence, 1996-97**

*The speed of service provided by the FSS varies according to the category of offence, the laboratory undertaking the analysis and the customer requirement.*

Category of offence	Standard target delivery times (days)					
	Chorley	Chepstow	Birmingham	Huntingdon	Wetherby	Metropolitan
Murder and attempted murder	42	49	65	65	84	84
Burglary	28	28	25	40	30	68
Vehicle crime	28	42	60	42	30	56

Source: National Audit Office fieldwork at FSS laboratories

**2.26** During our visits to the FSS’s sites in spring 1997, we found that the standard target delivery times varied between laboratories for the same offence categories (Figure 21). As a consequence, the police customers of certain FSS laboratories may experience a slower service than forces in other parts of the country. The FSS is attempting to standardise these targets as part of a general effort to increase consistency.

**2.27** The FSS has a target to meet 90 per cent of actual delivery dates agreed with customers. It achieved this target in 1994-95 and again in 1995-96, and reduced turnaround times for most offence types. In 1996-97, the FSS did not meet the 90 per cent target, with 81 per cent of work being completed within target

delivery dates (Figure 1 on page 3). This shortfall in performance is attributable to factors relating to the merger in April 1996 with the Metropolitan Police Forensic Science Laboratory (the Metropolitan Laboratory achieved 73 per cent of agreed delivery dates in 1996-97) and delays in the processing of DNA work (only 51 per cent of DNA work was delivered by the agreed deadline). The FSS is some way from achieving the 90 per cent target for 1997-98. By December 1997 it was reporting 71 per cent of all work delivered within target, although it was forecasting an improved performance of between 82 and 87 per cent for 1997-98 as a whole (Figure 1).

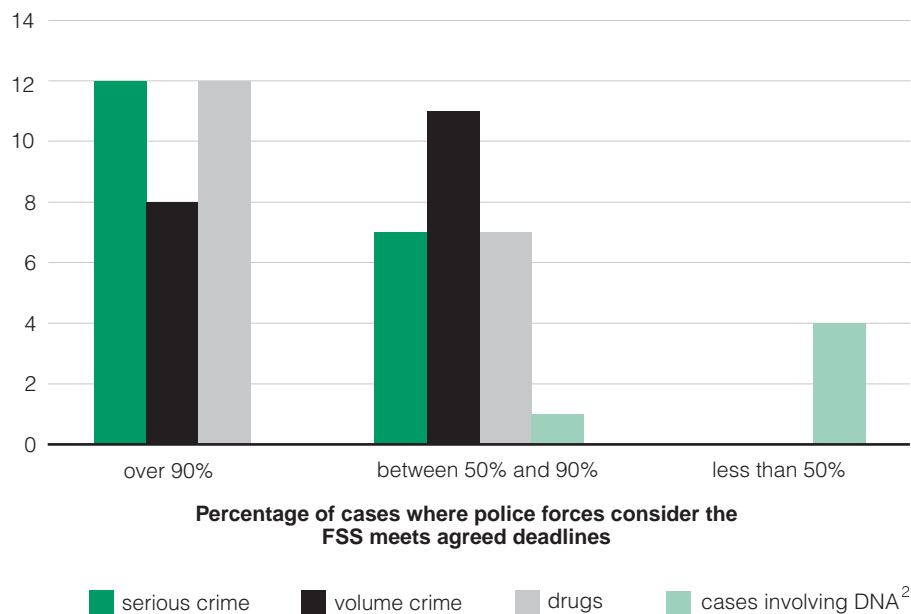
**2.28** In the course of our visits, we found that where police officers had not specified a delivery date, staff usually set delivery dates in line with the target delivery times for the laboratory. Where a backlog of work existed, target dates sometimes appeared to have been changed without consultation with customers. Police forces responding to our survey considered that the FSS performed reasonably well in meeting agreed deadlines. However, some forces expressed

**Extent to which police forces consider the FSS meets agreed deadlines**

**Figure 22**

*Police forces consider that the FSS performs reasonably well in meeting agreed deadlines, although five forces expressed concern about the processing of cases involving DNA testing.*

Number of forces<sup>1</sup>



Notes: 1. One force did not provide an estimate of the extent to which the FSS meets agreed deadlines.

2. Five forces offered views on the processing of cases involving DNA.

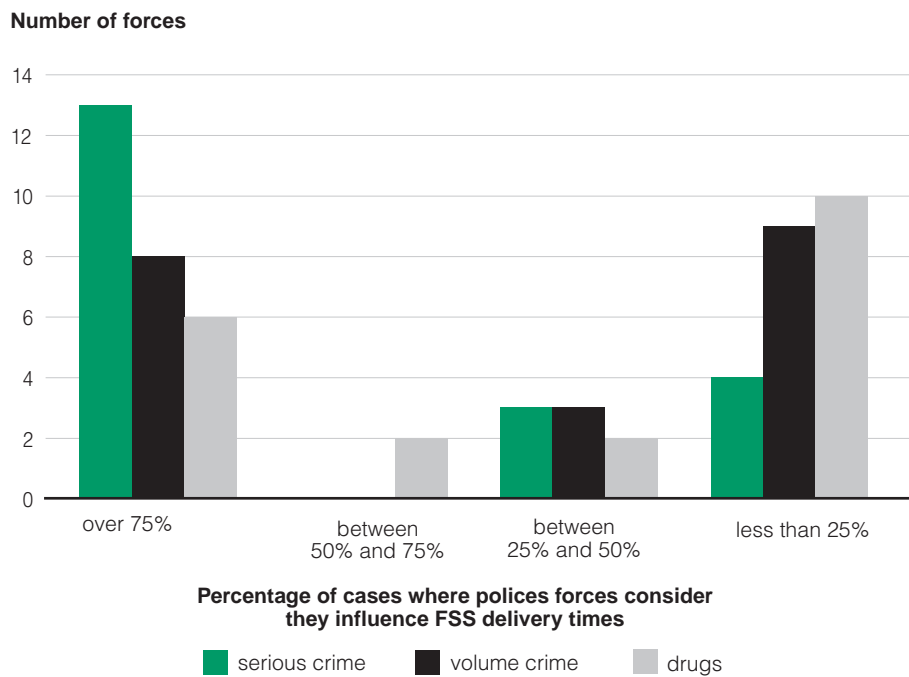
Source: National Audit Office survey of 20 police forces

concern about the processing of cases involving testing of DNA (Figure 22). Most forces felt more able to influence the deadlines for the delivery of work in cases of serious crime than for volume crime or drug analyses (Figure 23). The FSS has some way to go to achieve certain of the standard targets currently being put in place. For example, its target for rape cases is to deliver 90 per cent of casework within 56 days of submission, against an actual achievement of 90 per cent of cases within 81 days at December 1997.

**Extent to which police forces consider they influence the deadlines set for the delivery of work submitted to the FSS**

**Figure 23**

*Most of the forces consider that they can influence the delivery times of serious crime work but they feel that they have less influence on volume crime and drugs cases.*



Source: National Audit Office survey of 20 police forces

**2.29** In monitoring performance by the percentage of cases cleared by a target date, there is a risk that staff may process new cases in preference to those which have already missed their target date. This risk can be countered by monitoring the age of cases which have missed their target date. Of the 10,400 jobs outstanding at the end of December 1997, 29 per cent had already missed their target delivery date. An age analysis of these jobs was not available, although the FSS does monitor average turnaround time.

## DNA workload

**2.30** The FSS is at the forefront of technological developments in the provision of forensic science, most recently in developing and implementing the use of DNA in crime investigations and processing high volumes of analysis for the National DNA Database. FSS scientists are able to extract and analyse DNA material taken from



traces of blood and other body fluids left at scenes of crime. The resulting DNA profile can be used to identify a suspect.

**2.31** DNA profiling techniques have advanced considerably in recent years, to allow more sophisticated forensic analysis. In particular this has improved the discriminating power of DNA analysis and has meant that DNA can be recovered from smaller case samples, and from samples where some degradation may have occurred. This has enhanced the ability of DNA analysis to contribute to criminal investigations, as well as allowing old cases to be revisited where evidence can now be recovered. Example F shows how DNA analysis can be used in mass screens of suspects, and Example G shows a case where old evidence was revisited. Senior police officers consider that the introduction of DNA techniques has been comparable to the advent of fingerprints in terms of its impact on the use of forensic science in crime investigations.

### Use of DNA profiling techniques in a mass screen

#### Example F

In a murder investigation, police undertook a targeted mass DNA screen of males. The screen was employed after routine offender profiling had considerably narrowed down the field of investigation. The focus of enquiries was on a male, in the 15 to 28 age group, who would know the victim, lived within half a mile radius of the crime scene and had a background (but not necessarily a conviction) of violence. The use of offender profiling enabled the police to identify 800 males who met one or more of the criteria in this profile. A DNA match to material from the crime scene was obtained from the first batch of 51 DNA samples.



**Use of DNA profiling techniques to link different crimes**

**Example G**

In a rape investigation, DNA evidence indicated a suspect as the perpetrator of a 1994 rape. The investigators wanted to check the suspect's possible involvement in a series of rapes going back to 1982, which was before DNA profiling had been developed. The only surviving material from these cases was on microscope slides but yielded profiles which were instrumental in obtaining a conviction for one of the rapes committed in 1982.

**2.32** The FSS has responsibility for developing, establishing and implementing the National DNA Database. This work is in addition to the FSS's normal DNA casework. The DNA Database went live in April 1995 when police forces started submitting DNA samples for analysis and inclusion on the Database. As at December 1997, some 250,000 samples taken from known and suspected criminals were held on the Database, together with a further 27,000 samples from unsolved scenes of crime. Figure 24 explains the background to DNA testing and the National DNA Database.

**2.33** DNA work is categorised by four types of sample (Figure 25 on page 41). Casework samples, submitted as part of a criminal investigation, involve a suspected connection between a known suspect and a scene of crime. Scene samples are taken from stains left at scenes of crime for inclusion on the Database; these are checked for possible matches with other samples already on the Database taken from either scenes of crime or from suspects of other offences. Suspect samples are also placed on the Database, similarly to test for any match against a scene of crime. Mass screen samples are taken on a voluntary basis for matching against samples for a particular scene of crime. The large majority of samples submitted for DNA analysis are samples taken from suspects for incorporation on to the National DNA Database.

**2.34** Since the launch of the National DNA Database in 1995, the FSS has experienced difficulties in processing the high volume of DNA suspect samples submitted by police forces. The consequent delays have adversely affected the achievement of delivery targets for all FSS work and have led to a considerable backlog in the number of suspect samples awaiting inclusion on the Database. The FSS estimates that the majority of suspect samples are currently taking approximately six months to process, with some taking over a year. As at December 1997, the backlog of suspect samples requiring inclusion on the Database stood at about 120,000.

**DNA technology and forensic science**

**Figure 24**

**What is DNA?**

DNA stands for Deoxyribonucleic acid. This is a chemical found in virtually every cell in the body and carries genetic information which determines the physical characteristics of an individual. Except for identical twins, each person's DNA is unique.

**DNA profiling casework**

The techniques used by the FSS involve looking at specific areas of DNA which are known to vary widely between people. DNA profiling seeks to analyse and measure these differences to indicate, for example, whether material such as blood or semen found on a victim or at a scene of crime originated from a suspect. Until the advent of the National DNA Database those cases requiring DNA profiling tended to relate to more serious crimes such as murder, manslaughter and rape and other sexual offences.

**The National DNA Database**

The FSS operates the National DNA Database on behalf of the Association of Chief Police Officers and is the principal supplier of DNA analysis to the Database. Established in April 1995, it was the first database of its kind in the world. Police may take non-intimate samples (mouth swabs or rooted hair) from persons suspected of, charged with, reported for, or cautioned for any recordable offence (defined broadly as offences for which a period of imprisonment may be imposed). In practice, the police are principally targeting three categories of offences: offences against the person; sexual offences; and burglaries.

The Database provides intelligence information to police forces by matching DNA profiles taken from suspects (suspect samples) to profiles from stains left at scenes of crime (scene samples), and by matching samples left at scenes of crime to each other. As at December 1997, some 250,000 suspect samples were held on the Database with a further 27,000 samples from unsolved crime scenes. There have been over 20,000 matches: 16,600 offenders to a crime scene, and 4,000 matches of one crime scene to another.

New provisions in the Criminal Evidence (Amendment) Act which became law in March 1997 give the police the power to obtain DNA samples from persons convicted of certain categories of violent and other offences before April 1995 who are serving their sentence in prison.

**Mass Screens of DNA profiles**

Mass screens are used where, for an especially serious crime, the suspect is considered to have particular characteristics which considerably narrow the field of investigation, for example, a local male, aged 18 to 25, living within one mile of the scene of a crime. DNA profiles are taken from individuals in the particular category on a voluntary basis and are compared to the profiles taken from samples left at the scene of the crime under investigation. As at December 1997, DNA mass screens had been used in 61 cases involving 19,000 samples given voluntarily, and 21 suspects had been successfully identified in relation to the offences.

**Acceptance of DNA evidence by the courts**

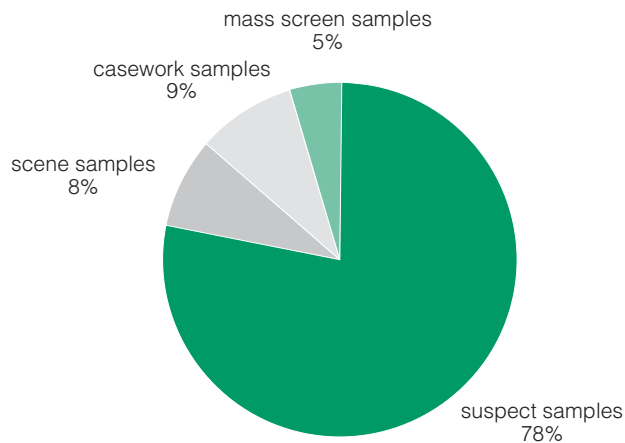
DNA evidence has been presented successfully in the courts since 1987. The techniques involved have changed and improved considerably so that DNA analysis has increasingly played an important role in the evidence presented in court. Testing can now be conducted with a sensitivity up to 1000 times greater than in 1987 to produce probability of match figures of typically one in 50 million.

Source:  
Forensic Science Service and  
National Audit Office

**Breakdown of DNA submissions by category**

**Figure 25**

*The majority of submissions to the FSS involving DNA samples are suspect samples requiring analysis and profiling on the National DNA Database.*



**Suspect samples** are non-intimate samples of DNA material taken from persons suspected of, charged with, reported for, or cautioned for any recordable offence and submitted by police forces to the FSS to be profiled and included on the National DNA Database. Since March 1997, following the Criminal Evidence (Amendment) Act 1997, samples have also been taken from prisoners convicted of certain categories of violent and other offences.

**Scene samples** are samples taken from stains left at unsolved scenes of crime and submitted by forces for inclusion on the DNA Database to establish whether they match against any of the suspect samples or other crime scene samples held on the Database.

**Casework samples** relate to samples submitted to the FSS for DNA analysis as part of a criminal investigation in which the police are seeking to link a known suspect with the scene of a crime.

**Mass screen samples** are samples taken on a voluntary basis from individuals who have particular characteristics, in order to be compared to the DNA profiles taken from samples left at the scene of the crime under investigation. Except where a mass screen identifies an offender, the FSS does not retain samples taken in a mass screen once the investigation has been completed.

Source: Forensic Science Service

**2.35** During 1996-97, the FSS also experienced backlogs in the processing of casework samples and scene samples. Our examination of completed cases found that scene samples (48 cases) requiring inclusion on the National DNA Database had taken on average 175 days to process. Three cases had taken 12 months or more.

**2.36** While recognising the need to balance the processing of crime scene samples and suspect samples in order to build up both segments of the National DNA Database without delay, the FSS and the Association of Chief Police Officers agreed in 1997 that scene samples and particularly casework samples should be accorded appropriate priority. The FSS has taken effective action to reduce backlogs of scene samples and casework samples and these were eliminated by autumn 1997. The FSS does not collect data on turnaround times for scene samples separately, but calculated average turnaround times for processing scene samples and casework samples combined at 26 days in December 1997 compared with 104 days in April 1997.

### **Factors contributing to delays and the National DNA Database backlog**

**2.37** The delays in the processing of DNA work, and the backlog of samples requiring inclusion on the National DNA Database, arise from a variety of factors, including the need to introduce and prove new technologies; the high and increasing level of demand from police forces for DNA services which was hard to predict; difficulties in the recruitment and retention of staff; problems with adapting specialised scientific equipment to high volume processing; and procuring additional processing capacity.

**2.38** Of these, one of the main contributing factors is the high and increasing level of demand from the police for DNA services. The number of casework samples submitted to the FSS has nearly trebled from 6,000 cases in 1994-95 to almost 17,000 cases in 1996-97. Some 27,000 scene samples had been included on the National DNA Database by December 1997. The FSS has also provided mass screening for some 61 serious crime cases, which has involved the analysis of around 19,000 volunteer samples. Furthermore, the number of suspect samples submitted by police forces continues to grow at a rate significantly above that originally forecast with the Association of Chief Police Officers. In 1995-96, the first full year of the Database's operation, the police submitted around 129,000 suspect samples, which was within the Association of Chief Police Officers' working estimate of up to 135,000. In 1996-97, the number of suspect samples submitted to the Database rose to 142,000, and up to 190,000 submissions are expected in 1997-98

**2.39** The FSS has lost some key members of staff to other suppliers competing in the provision of DNA analysis services, including the production manager, production team leaders and production line workers. These losses represented a considerable training investment and led to a reduction in processing capacity until new staff were recruited and trained.

**2.40** In August 1995, the FSS identified significant technical problems with some of the scientific equipment used to analyse and profile DNA samples for the National DNA Database. These problems were sufficiently serious to require analysis to be stopped while all the profiles on the Database were reviewed. Following an extensive review, the FSS traced the source of the problem and took action to resolve it. In order to meet the increasing level of submissions to the Database, the FSS decided to set up a second processing centre at the Metropolitan Laboratory in 1996. This second centre commenced operation two months later than planned owing to delays in obtaining and commissioning equipment essential to processing DNA samples and building work.

### **Measures to improve speed of delivery of DNA services**

**2.41** The FSS has taken a number of measures to improve speed of delivery and reduce the DNA Database backlog, in addition to establishing the second DNA processing centre at the Metropolitan Laboratory. For example, more staff are now employed on processing; 24-hour working has been introduced at the Birmingham processing centre to ensure that equipment is being used to full capacity; and a robotics system automating certain parts of the sample testing has been validated and was partly in place by the end of 1997. It is anticipated that these latest developments will increase overall processing capacity to some 300,000 samples a year. The FSS expects to eliminate the backlog of suspect samples by the end of 1998.

**2.42** The FSS is the custodian of the National DNA Database on behalf of the Association of Chief Police Officers. The role of the custodian is to ensure the integrity of the Database, for example by setting quality standards. When the DNA Database was launched in 1995, the FSS was the only supplier of DNA analysis for the Database. Before another supplier could provide an analysis service, the supplier would need to develop appropriate processes, procedures and systems to achieve the necessary accreditation, including by the United Kingdom Accreditation Service, to provide analysis for the Database. As custodian of the Database, the FSS would provide assistance to the potential supplier of DNA analysis with regard to technical process issues.

**2.43** Following discussions with the Home Office and consultation with police forces, a private sector company the LGC (Laboratory of the Government Chemist) took a decision early in 1997 to invest in a new laboratory facility for providing DNA profiles for inclusion in the Database. The facility is accredited by the United Kingdom Accreditation Service. At the request of the Association of Chief Police Officers, the LGC submitted test sample results to the FSS and was endorsed as an

alternative supplier in October 1997. The company has the capacity to process 30,000 samples a year, and is planning a target capacity of 100,000 samples a year. Samples are submitted by police forces and the resulting profiles are supplied to the FSS, which as custodian is responsible for inputting the DNA information on the Database.

## Communication

### *Main findings*

---

Communication between the FSS and its customers has improved, and the FSS is educating customers about the capabilities of forensic science. In some types of investigation it is important that the FSS has comprehensive details of the case and the evidence, including a list of items not submitted for analysis. More could be done to improve the information provided by customers on individual cases.

The FSS has a contract with HM Customs and Excise and service level agreements with four police customers. It is developing these further with a view to trialling a model service level agreement with other police forces later in 1998.

---

**2.44** For the FSS to produce work that is useful to its customers, it is usually helpful for forensic scientists to have an understanding of the circumstances of the case to provide a context for their results. A joint study conducted by the FSS and the Association of Chief Police Officers during 1994-95 'Using Forensic Science Effectively' found poor awareness about forensic science among key investigating personnel in the police, and concluded that communication between the FSS and the police needed to be improved. The report also found variations in practice across police forces in the extent of information supplied to the FSS. Since the report was published in 1996, the FSS has sought to improve communication and police awareness of the potential contribution of forensic science through the development of specialist advisors to provide an additional link with customers.

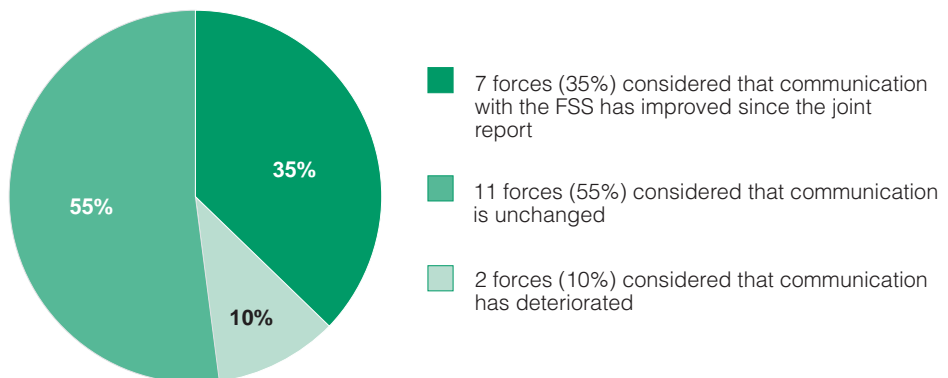
**2.45** Our survey of police forces found that most forces consider that communication with the FSS has either remained unchanged or improved since the joint report by the Association of Chief Police Officers and the FSS was published (Figure 26). The forces identified a number of areas where communication could be improved further, for example by providing reports on all DNA results, earlier notification of any delays in meeting target delivery times, and more discussion between scientists and police officers during investigations. Our case examination showed that discussions between scientists and police officers do not always take place even in serious crime cases. Excluding drugs cases and scene samples submitted for inclusion on the National DNA Database (where communication would not normally be necessary, since the analysis requested is

routine), 62 per cent of the (86) case files contained some evidence of communication. In serious crime cases, which often involve complex analysis, there was more evidence of communication (81 per cent of cases).

**Police views on quality of communication with FSS and their suggestions for improvement**

**Figure 26**

*Most police forces consider that communication with the FSS has either remained unchanged or improved since the publication of the joint report of the Association of Chief Police Officers and the FSS in 1996 - Using Forensic Science Effectively - which identified a number of ways in which communication could be improved further.*



**Suggestions from the survey for improving communication between police forces and the FSS**

- closer liaison between FSS and police forces
- clearer information about submissions of samples to the National DNA Database, including regular feedback to police forces on latest turnaround times for DNA work and feedback on all results, including "no match" reports; and regular summary reports of successful matches and of crime scenes generating a DNA profile
- a best practice guide for the police on recovery of DNA samples
- quicker attendance of FSS scientists at scenes of crime by effective use of communication systems
- improved response to telephone enquiries by FSS
- better notification by FSS of likely delays in meeting target delivery times
- more discussion between the investigating officer and the FSS scientist before and after the casework
- technical updates by the FSS to police forces on information relating to scene of crime examinations

Source: National Audit Office survey of 20 police forces

**2.46** Our case examination and discussions with FSS staff confirmed that practices across police forces varied in the extent to which information was supplied to scientists. In all the cases examined the items submitted were accompanied by a submission form, but

- forces did not always provide full details of all relevant items found at the crime scene including those not submitted; and
- relevant case information was not always provided, even in serious crime cases (Figures 27 and 28). Occasionally, however, the information submitted was very detailed, as for example for much of the casework submitted by Dyfed-Powys police.

**Case information provided by FSS customers**

**Figure 27**

*The FSS often does not receive all relevant case information from customers.*

Information	Received from customer	
	Yes	No
Witness statements (86 cases) <sup>1</sup>	13	73
Police Scene of Crime Officer examination forms (86 cases) <sup>1</sup>	13	73
Sexual Offence forms (8 cases) <sup>2</sup>	3	5

Notes: 1. Of the 216 cases examined, scene samples submitted to the National DNA Database (48 cases) and drugs cases (82 cases) are excluded from this analysis because in most instances additional information was either not available or not needed by the FSS.  
 2. Cases involving rape or other sexual offences.

Source: National Audit Office case examination

**Information provided by police forces in serious crime cases**

**Figure 28**

*The FSS does not always receive all relevant information from police forces even in cases of serious crime.*

Proportion of serious crime cases in which the information was provided	in less than 25 per cent of cases	between 25 and 50 per cent	between 50 and 75 per cent	over 75 per cent of cases
Witness statements	7	2	3	8
Photographs	4	4	3	9
Scene of crime examination form	14	-	1	5

**Number of forces providing relevant information**

Source: National Audit Office survey of 20 police forces



**2.47** Police forces gave a range of reasons for not submitting details other than those contained on the submission form accompanying the items:

“force policy is not to submit a scene of crime examination form”

“statements are not normally provided, except for sexual offences where they can be of great value; the scientist should request any information not submitted”

“submitted forms should contain all relevant information; further information would be submitted if requested by FSS”.

**2.48** These observations suggest a need for the FSS to clarify its information requirements with customers and for customers to review their information submission practices. There may be increased scope for customers to provide background information which would support the work done by the FSS on the case. For example, a list detailing all items found at the crime scene, including those items not submitted to the FSS, would often be helpful, as would the scene of crime officer’s report. If appropriate, witness statements and photographs should also be provided.

**2.49** The FSS obtains informal opinions on the work of its laboratories from the police and Crown Prosecution Service at local level. However, there are no systems for obtaining feedback on individual cases, and customers rarely provide such feedback unprompted. Our examination of cases found no evidence of feedback from customers about the usefulness of specific forensic reports.

**2.50** One vehicle for encouraging local forces to increase the level of feedback to the FSS, both generally and in specific cases, would be through training. The FSS provides training to police forces and the Crown Prosecution Service in order to increase awareness of forensic science and its capabilities. Over 80 per cent of the police forces who responded to our survey were satisfied with the training provided, although nearly half wanted more, particularly to improve scene of crime officers’ awareness of forensic issues. The FSS has since launched a joint project with the Association of Chief Police Officers designed to help forces to improve their use of forensic science, for example through focusing on how forensic analysis can be used in investigating specific types of crime.

## Service level agreements

**2.51** The FSS is beginning to develop service level agreements with its customers to put services on to a firmer basis with agreed levels of service. At December 1997, the FSS was operating service level agreements with four forces (City of London, Metropolitan Police Service, Essex and Avon & Somerset) and a formal contract with HM Customs and Excise. The contract with HM Customs and Excise is relatively sophisticated. The service level agreements with the police are less precise and require further development to enable them to conform fully with guidelines issued by the Government's Central Unit on Procurement (Figure 29).

### Key requirements for a service level agreement

**Figure 29**

- Objectives
- Client and service provider details
- Agreement of period of time to be covered by service level agreement
- The specification
- Method of operation
- The quality plan
- Performance monitoring
- Basis of costs
- Resolution of disputes
- Remedies in the event of inadequate performance
- Review of the agreement
- Liaison
- Termination

Source: Guidelines on Service Level Agreements issued in January 1994 by the Government's Central Unit on Procurement

**2.52** Having agreements in place with each police force would enable the FSS to predict its workload more accurately and to plan resources to meet requirements. The FSS intends to build on a model service level agreement developed with one police force (City of London Police) which includes performance targets. The agreement is being piloted with the four police forces, and the pilot is planned to be extended to other forces later in 1998. Extension to all forces is being considered during 1998, and will be taken forward in consultation with the Association of Chief Police Officers. The model service level agreement has 10 of the 13 key requirements set out in the service level agreement guidelines (Figure 29). The agreement could be improved by including remedies for inadequate performance, and arrangements for liaison and for termination.

## Part 3: Assuring the quality of forensic evidence

**3.1** The criminal justice system requires forensic scientific evidence to be accurate and impartial. In order to maintain credibility, the FSS must demonstrate high standards of reliability and independence in examining and testing items of evidence. In examining this key aspect of the FSS's work, we did not seek to reassess the scientific judgements made in individual cases or to reperform particular scientific tests. The question we addressed was whether the FSS has adequate systems and procedures in place to control and ensure the quality of its scientific work. This part of the report therefore considers:

- the FSS's own quality management systems for ensuring that the scientific quality of its work meets national and international standards;
- arrangements for audit and quality assurance; and
- educational standards and standards of personal and professional conduct of FSS scientists.

Figures 30 and 31 outline the FSS's quality management process and the responsibilities for monitoring quality.

### Quality Management

#### *Main findings*

---

All scientific techniques are validated internally and externally before use by the FSS to check that the methods are scientifically valid and that the FSS has the appropriate resources, both staff and equipment, to operate them.

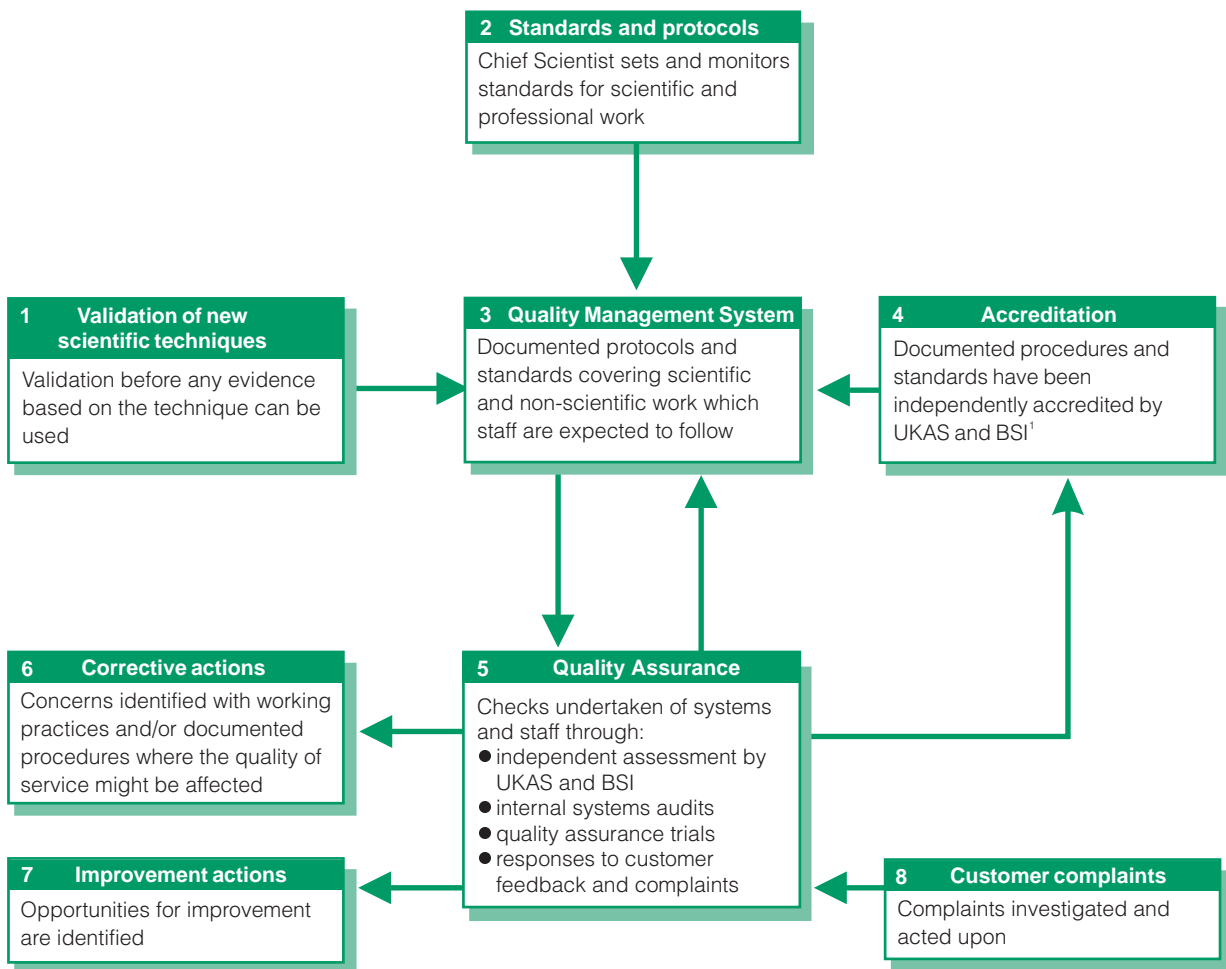
In order to minimise the risk of quality failures, the FSS has its own Quality Management System which meets recognised national and international standards and is accredited by independent standards organisations. The system documents about 70 per cent of the scientific and administrative procedures of the FSS, and provides complete coverage for around 98 per cent by value of FSS products. More specific, detailed standards for particular products are being developed, starting with those most frequently provided to customers. Product standards have currently either been established or are under development for around two-thirds by value of FSS products.

---

**3.2** The FSS uses established technical procedures based on published scientific methods generally accepted by the scientific community. All new scientific techniques (Box 1, Figure 30) have to be internally and externally authorised and validated by the FSS Chief Scientist (Figure 31) before they are

**Figure 30**

**Quality Management Process in the Forensic Science Service**

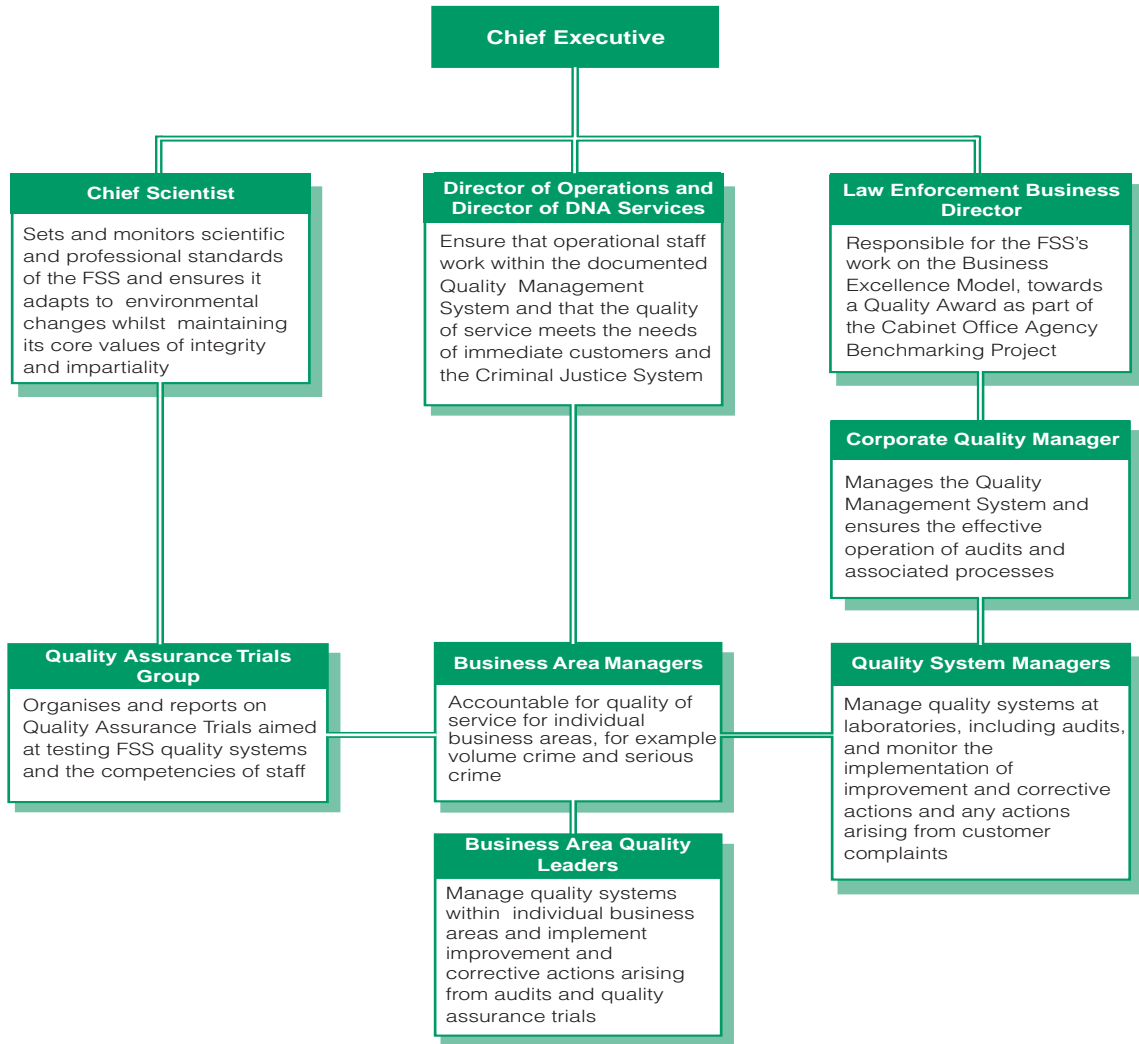


Note: 1. United Kingdom Accreditation Service and British Standards Institute

Source: Forensic Science Service

**Figure 31**

**Responsibilities for managing the quality of work within the Forensic Science Service**



Note: A Corporate Quality Committee is responsible for the management of quality within the FSS. The Committee's membership is shown at Appendix 1.

Source: Forensic Science Service

used in casework and in criminal proceedings, or offered as commercial services. The FSS keeps records of the published documents which validate the methods. Validation involves demonstrating that:

- the method has been reviewed by scientific experts, published (if sufficiently novel) and generally accepted by the relevant scientific community;
- the method is robust and reliable and is fully documented with appropriate scientific standards;
- the results obtained accord with the expected outcomes;
- appropriate arrangements are in place for the calibration and maintenance of any equipment used and the quality control of key materials (for example to avoid cross contamination); and
- staff have been trained and proven to have the necessary skills to carry out the technique, obtain the expected results, and interpret and report on their findings.

**3.3** FSS scientists have worked to documented protocols and standards for many years (Box 2, Figure 30). The protocols and standards are set by groups of experts, sometimes including scientists from other national and international organisations. Since becoming an executive agency in 1991, the FSS has further developed the protocols and standards, and documented them within a Quality Management System (Box 3, Figure 30) which embraces most of its work, both scientific and non-scientific. The Quality Management System covers 26 distinct technical areas including firearms, marks and toxicology, and a further 19 general topics including handling of casework, customer services, packaging, finance, procurement, security and health and safety. The FSS's objective is to minimise the risk of quality failures by assuring the competence of its staff; that they work to sound documented procedures; and by applying consistent standards across the six sites.

**3.4** Through discussions with FSS staff and review of key documentation, we established the current state of development of the Quality Management System.

- The Quality Management System currently documents about 70 per cent of the scientific and administrative procedures of the FSS.
  
- The remaining 30 per cent which are not documented are mainly administrative procedures, for example when, and in what circumstances, to consult and communicate with customers.
  
- Thirty-seven per cent of the 122 products offered to the police, including blood pattern analysis and vehicle component examinations, did not have completely documented standards and procedures in the Quality Management System. However, these covered only around two per cent of the value of products actually requested, so that the Quality Management System provides complete coverage of around 98 per cent by value of FSS products. The FSS is working to achieve 100 per cent coverage.

**3.5** Since 1993 the FSS's procedures have been independently accredited (Box 4, Figure 30) to National Accreditation of Measurement and Sampling (NAMAS) standards. Accreditation is by the United Kingdom Accreditation Service (UKAS), which is a private sector company accountable to the Department of Trade and Industry. The FSS is also registered by the British Standards Institute (BSI) to ISO 9000 series of Quality Management standards. FSS procedures have to be accredited separately at each of its six sites, and in 1995-96 accreditation was extended to cover the National DNA Database, Research and Development, and Information Technology Support Services. Accreditation is maintained through regular assessment by the external bodies.

**3.6** The merger with the Metropolitan Police Forensic Science Laboratory (paragraph 1.11), which had its own technical quality system, is currently resulting in two different technical quality systems running in parallel, although these are in the process of being merged. Casework from provincial forces may be carried out at any FSS site, but the majority of the casework of the Metropolitan Police Service must be conducted at the Metropolitan Laboratory using the procedures in place before the merger. The Metropolitan Police Service values these arrangements, agreed at the time of the merger, which will remain in place until 1999.

**3.7** To enable more consistent product delivery and products tailored more closely to customer requirements, the FSS has initiated a programme of work to specify detailed national standards for particular products, including required staff competencies and qualifications. The aim is to have a consistent portfolio of scientific standards and operational procedures for each product. As at December 1997, the FSS had established product standards for 14 of its 170 products offered to the police and HM Customs and Excise. A further 16 product standards are at final draft stage or under development. This total of 30 products represents 62 per cent of the value of products actually delivered.

## Audit and quality assurance

### *Main findings*

---

Scientific staff record all casework activities. All results are subject to review by a second authorised scientist before being released to customers.

The FSS has three separate but complementary arrangements in place to provide quality assurance of its work. These are external quality audits, internal system audits and casework quality assurance trials. The general picture from the results of the 1996-97 quality assurance was one of improving standards, although only two-thirds of the internal quality audits which cover all the FSS's procedures, both scientific and non-scientific, had been completed, ranging from a half at one site to around 90 per cent in two others.

Some 60 casework quality assurance trials were conducted in 1996-97 involving some 1,000 scientific tests. The tests yielded a low level - 1.5 per cent - of unsatisfactory results. In one case only, the result could have incorrectly linked a suspect to a crime; and in the remainder the results failed to identify a link between a suspect and a crime. For each unsatisfactory test result the trial assessor found that the overall conclusions reached in the trial would not have been affected because of the weight of evidence obtained using other tests.

Where the audits and trials identify problems with the operation of the Quality Management System, the FSS establishes what corrective or improvement actions are required and has a system to ensure that these are followed through. However, not all actions are given target dates. We found that those without target dates were more likely to remain outstanding for longer than those for which target dates had been set.

While the FSS maintains local records of actions taken, it has not maintained a central record since 1995-96. This limits the extent to which senior management of the FSS can identify trends in errors identified and actions taken, and check on the progress of actions for a particular site or work area on the basis of routinely available information. The FSS recognises that a single central record is the best way forward and is in the process of procuring a computerised system to be in operation during 1998-99, which will support the follow-up of actions arising from quality assurance.

---

**3.8** The FSS maintains detailed records in order to comply with the prescribed quality standards and to ensure that documents and data are available for legal purposes. Documentation includes case files containing the results and



interpretation of scientific analysis; instrument records, including the history of calibration and maintenance; scientific methods and their validation; and training records of the staff undertaking the work.

**3.9** Where a scientist obtains a result which cannot be repeated or where the interpretation of the result is subjective, the Quality Management System requires the finding to be confirmed at the time of the test by a second authorised scientist. For all reports and statements provided to customers, the results and conclusions of scientific examinations are reviewed by a second authorised scientist, who checks them against material on the case file. Because these reviews are required to be fully documented, our case examination was able to check that the requirements for review were being met; for all the cases we examined, the files contained evidence that the main findings and witness statements had been reviewed in the manner required by the Quality Management System.

**3.10** The FSS has three separate but complementary arrangements in place to provide quality assurance of its work (Box 5, Figure 30).

- As conditions of the FSS's accreditation there are visits by assessors from UKAS (annually) and BSI (twice yearly) to assess compliance with the NAMAS and BSI standards. These assessments include checks on the adequacy of the FSS's quality management systems, compliance of actual practice against the documented procedures, the extent to which the FSS has subjected its work to audit and review, and the way in which the FSS is dealing with any complaints and anomalies.
- Annual internal system audits are conducted by staff with appropriate experience to check that working practices for all elements of the Quality Management System adhere to the documented procedures, and that the systems employed are effective. These audits are planned to cover all the FSS's procedures.
- Casework quality assurance trials are operated which take the form of test cases developed internally or bought in from other scientific organisations. The cases are submitted to FSS laboratories either overtly or without the scientists' knowledge to test the competence of staff, consistency and the effectiveness of the whole system at each site.

**3.11** For the three categories of quality assurance, we reviewed the results in 1996-97 across the FSS sites. The general picture was one of improving standards of forensic science work; for example, the performance of the FSS in casework quality assurance trials had improved for the sixth successive year.

**3.12** The internal and external quality audits test compliance with established procedures. They seek to identify any difficulties in operating the Quality Management System which might affect the quality of service to customers, and opportunities for improvements. We found that not all scheduled internal quality audits are being completed. Of the 155 audits planned for 1996-97, 66 per cent were undertaken. Performance ranged from 89 per cent complete at two sites (Chepstow and Birmingham) to 51 per cent at one (Metropolitan). At some sites audits were conducted by local staff rather than staff from a different FSS site. However, in these cases some independence of the audit team was achieved by using staff from different work areas from that being audited. All sites currently arrange the audits themselves. If the audits were arranged by business area (drugs, volume crime, serious crime and analytical services), this would enable teams of auditors to draw comparisons between different sites.

**3.13** The FSS runs casework quality assurance trials, each of which comprises a number of different scientific tests. Scientists are sometimes told about the trial and on other occasions the trial is included in their normal casework without their knowledge.

**3.14** The objective of the casework quality assurance trials is to test the quality assurance systems and thereby give FSS managers, staff and customers confidence that the systems are operating properly. The trials are not intended to enable the FSS to draw conclusions about possible error rates in actual casework. The FSS has a very wide range of different casework across its six laboratories. To obtain statistically valid results for all types of casework at all laboratories, the FSS would have to run very large numbers of trials which would be impractical and disruptive. By focusing the testing on the quality systems, many of which are used in different types of casework, the FSS aims to gain effective assurance using a manageable number of trials.

**3.15** The 61 casework quality assurance trials conducted in 1996-97 involved some 1,000 scientific tests. A test is considered to yield an "unsatisfactory result" where the scientist's conclusion about a link, or the absence of a link, between a suspect and a crime is either incorrect or not fully supported by the evidence. The proportion of unsatisfactory results among the 1,000 tests was 1.5 per cent, which compared favourably with the trials undertaken in the previous year. For one of these unsatisfactory results, the evidence could have incorrectly implicated the suspect. In the further 14 instances, the scientist had failed to find the evidence present or had underestimated its value to link a suspect to a crime. In each case where an unsatisfactory result had been identified, the trial assessor reviewed the effect of the error on the whole case and found that there was other evidence which was conclusive, and which the assessor considered would have overridden the

unsatisfactory test's overstatement, understatement or failure to find evidence. Where a test result has implications for actual casework, the potential effect on actual cases is assessed and if necessary the customer is contacted to discuss the implications in the context of the other evidence in the case.

**3.16** Where the casework quality assurance trials or the internal or external quality audits identify practices not in compliance with the FSS's Quality Management System and which might affect the quality of the service provided to customers, corrective actions are agreed between the quality auditor and the relevant FSS manager. A date is usually set by which the corrective action must be completed, and records of progress of corrective actions are maintained at each site. Similarly, identified opportunities for improvements to work processes result in improvement actions which should also have agreed target dates for completion.

**3.17** The FSS estimates that some 680 corrective actions were raised as a result of quality audits and reviews in 1996-97, many of which resulted from failure of staff to follow routine procedural instructions. The main areas highlighted by quality audits and reviews were:

- DNA (14 per cent of corrective actions), including controls specified in the Quality Management System not being followed in respect of evidence of calibration of some equipment and monitoring refrigerator/freezer temperatures where samples are stored;
- casework management (12 per cent), including case files not showing all test results; case files not containing written instructions from senior reporting officers outlining the work required from scientists; and customers not being informed of revised delivery dates for casework when the original deadlines could not be met;
- Quality Management System (11 per cent), including customer complaints and corrective actions raised by internal audit not being actioned or assigned a target date; and out of date Quality Management System documents continuing to be used; and
- calibration (8 per cent), in respect of the completeness or accuracy of equipment monitoring records.

**3.18** We examined the corrective and improvement actions raised between October 1996 and March 1997 (Figure 32). Of 376 corrective actions raised in the period, 169 (45 per cent) had been completed by the end of the period. Of these, nearly half had been completed within their target date, 41 per cent outside target, and 11 per cent had no target. Of those corrective actions outstanding at April 1997, a much greater proportion - 43 per cent - had no target. The

**Figure 32** Corrective and improvement actions raised during quality audits between October 1996 and March 1997

Thirty-eight per cent of corrective and improvement actions raised through audits between October 1996 and March 1997 had been actioned by the end of March 1997. Those actions still outstanding comprised a disproportionately high number for which no target date had been set.

	Actions raised	Completed by April 1997			Outstanding at April 1997				
		Total completed at April 1997 (per cent)	Within target	Outside target	No target set	Total outstanding at April 1997 (per cent)	Target set later in 1997-98	Outside target	No target set
Corrective actions <sup>1</sup>	376	169 (45%)	48%	41%	11%	207 (55%)	33%	24%	43%
Improvement actions <sup>2</sup>	196	48 (24%)	38%	33%	29%	148 (76%)	22%	24%	54%
<b>Total</b>	<b>572</b>	<b>217 (38%)</b>	<b>46%</b>	<b>40%</b>	<b>14%</b>	<b>355 (62%)</b>	<b>29%</b>	<b>24%</b>	<b>47%</b>

- Notes: 1. Corrective actions arise where any occurrence or practice is observed not to be in compliance with FSS policies, procedures and work instructions which might affect the quality of service provided to customers.  
 2. Improvement actions are less serious, and arise where opportunities are identified for improvements to work processes or the quality of work undertaken.

Source: National Audit Office examination of FSS's records of corrective and improvement actions

196 improvement actions raised in the period had a lower proportion completed (24 per cent) and a greater proportion without target dates for both completed and outstanding actions (29 per cent and 53 per cent respectively). By December 1997, the FSS had reduced the proportion of these corrective and improvement actions which were still outstanding to 6 per cent and 23 per cent respectively.

**3.19** Occasionally a serious concern will arise from human error by an individual scientist. In such circumstances, the scientist may be withdrawn from the particular type of work until his/her competency has been reassessed following retraining. The FSS Chief Scientist said that there had been four such incidents since 1994 in which scientists had been withdrawn as a result of errors identified through casework quality assurance trials. Each case involved a different area of forensic work: examination of tool marks; examination of fibres; analysis of gunshot residue; and DNA analysis. In the first two of these, individual scientists were withdrawn, and in the second two cases all the work being undertaken in the particular areas was stopped. On each occasion, the FSS took appropriate action to investigate the circumstances of the error; to consider the implications for actual casework; to make any necessary changes to work practices and procedures; and to ensure that the scientists had achieved the necessary level of competence before

being approved to return to the area of work under investigation. The FSS's investigations into the circumstances of these four incidents did not reveal any major implications for actual casework.

**3.20** All actions to withdraw a scientist or stop work have to be authorised by the Chief Scientist on behalf of the Chief Executive, and such authorisation is obtained in all appropriate cases. However, accreditation requires each site to be assessed as a separate entity, and whilst local records are maintained, central records of actions undertaken as a result of errors identified through quality assurance have not been held since 1995-96. The four incidents described above may therefore not be an exhaustive list. The FSS recognises that a single central record is the best way forward, and is in the process of procuring networked quality management software, which is expected to facilitate the reinstatement of central records in 1998-99.

**3.21** A central record of errors found and actions taken would enable the FSS to identify trends in the nature of errors identified and the actions needed to put matters right. The record would also enable the Chief Scientist and others concerned with the operation of quality systems across the FSS to consider whether there should be periodic central input in particular cases to check that the implications for actual casework have been thoroughly considered and the necessary remedial actions taken. To be of use to management, the record would need to contain certain key information for each local quality audit trial concerned, including the work area under investigation; the outcome; the source of any error (for example, work practices, procedure or individual scientist); any implications for actual casework; remedial action and timescale for completion; and signing off of the action by an appropriate member of staff. The FSS is developing improved arrangements for following up actions arising from casework quality assurance trials and quality audits which will take account of these information requirements.

## **Educational standards and standards of personal and professional conduct**

### *Main findings*

---

Nearly three-quarters of FSS staff are scientific grades with relevant degrees. Staff are expected to demonstrate the highest possible professional and personal standards and integrity, working to an established Code of Practice. The FSS is participating in the "Investors in People" programme, but implementation has been delayed due to the work arising from the merger with the Metropolitan Police Forensic Science Laboratory.

---

**3.22** At March 1997, the FSS employed 1,226 staff; some 80 per cent are employed on casework. Virtually all FSS forensic scientists who write statements and give evidence in court are qualified to at least second class honours degree level, and many have higher degrees in scientific subjects. Assistant scientists who undertake examinations of items to recover evidence generally have lesser qualifications, but many also have degrees. Most recruits to scientific posts are graduates appointed directly from university. Recruitment is, as for all FSS posts, on the basis of the candidates' ability to demonstrate integrity, expertise, ability to do the job, and the potential for development. For permanent appointments, recruitment is by open competition.

**3.23** Following the reorganisation of the FSS into business areas in 1996, over 50 new posts were created within existing resources; for example business area development managers, specialist advisors on forensic science, operations business managers and business area quality leaders. These new posts were filled internally by existing FSS staff at selection boards which looked for staff with the key attributes required or the potential to develop them. For example, the key attributes of a specialist advisor are shown in Figure 33.

**Key attributes of a specialist advisor on forensic science**

**Figure 33**

- an experienced forensic scientist with an understanding of the technical processes employed, their values and limitations
- ability to manage customer relationships and the customer/scientific interface
- ability to assess customer requirements for each case and translate them into products or services to maximise benefit
- understanding of the contributions of other professions to the investigative process
- knowledge of the requirements of the criminal justice system and the strategic and operational requirements of law enforcement agencies
- commercial awareness
- well developed interpersonal skills
- effective communicator of business targets

Source:  
Forensic Science Service

**3.24** The FSS established a code of practice in 1992 which all staff are expected to work to throughout their involvement in the criminal justice process (Figure 34). The FSS believes that it is only through the development and acceptance of codes of practice, and by visible adherence to them, that forensic scientists can fulfil their role as an expert in the criminal justice system.

**FSS Code of Practice**

**Figure 34**

<b>Personal expertise</b>	Staff should keep their knowledge and skills up to date, confining their work to their own areas of competence and expertise.
<b>Integrity of evidence</b>	Staff should ensure as far as possible that the integrity of items submitted to them has not been compromised and that integrity of items is maintained while in the FSS's custody.
<b>Scientific examinations</b>	Staff should take professional responsibility for determining customer requirements, for ensuring that the items submitted are sufficient for the examination to be scientifically acceptable, and that the customer is aware of any limitations of the material supplied. The examination should follow agreed procedures using reliable methods and appropriate equipment.
<b>Impartiality</b>	Staff should objectively consider the items of evidence for examination and ensure that scientific data and conclusions are soundly based. They should also ensure that opinions are placed in the context of the case as presented, giving reasonable possible alternatives where appropriate.
<b>Advice and reports</b>	Staff should present their findings in accordance with the practice and rules of confidentiality and disclosure, and in a way that can be understood by the appropriate person; reporting all relevant findings; and ensuring as far as possible that those involved in the criminal justice system are aware of the strengths of their evidence and any limitations.
<b>Service levels and value for money</b>	Staff should take full account of customer's service requirements, including timeliness, recognising the need for effective and efficient use of resources within the framework set by professional standards.
<b>Management</b>	The FSS is committed to supporting the work of its staff by making clear what is expected of them; setting standards of work; providing training to maintain and develop personal skills, knowledge and competencies; providing supporting information, systems and resources, and a safe and healthy working environment.

Source:  
Forensic Science Service

**3.25** In addition to their formal academic qualifications, all forensic scientists receive extensive “on-the-job” training by working with experienced scientific caseworkers. There is formal structured in-house training on specific aspects of the forensic scientist’s work. Forensic scientists in the FSS are not allowed to give

evidence in court until they have received adequate training and demonstrated their competence following attendance on the FSS's own expert witness course, and usually by having at least two years' experience.

**3.26** The FSS's "Investors in People" programme (Figure 35) for the training and development of staff is intended to underpin the FSS's human resource strategy and development of its people. The implementation of the programme is planned to involve, among other things, a restructuring of the FSS's internal training and development and the step by step implementation of the National Vocational Qualification in Forensic Science, the FSS being the leading player in the development of national standards of competence. Some aspects of the programme have been delayed from summer 1997 owing to the work arising from the merger with the Metropolitan Police Forensic Science Laboratory. The FSS now intends to implement the programme by the summer of 1998.

#### Investors in people

#### Figure 35

"Investors in People" is a nationally recognised standard, awarded to organisations that demonstrate effective investment in the training and development of their staff to achieve defined organisational goals. It is based on the practical experience of some of the United Kingdom's most successful organisations and may be regarded as a benchmark of best practice. An Investor in People has a planned approach to setting and communicating organisational goals; develops staff to enable them to deliver the goals; and measures the impact of training and development in enabling the organisation to deliver those goals. Working towards the standard is expected to generate a culture of continuous improvement.

Source: Cabinet Office,  
Office of Public Service



## Part 4: Custody of forensic evidence

**4.1** The criminal justice system requires the FSS to demonstrate the integrity of all items and casework material in terms of maintaining evidence intact, without loss or addition, and ensuring that the chain of custody remains sound, so that evidence presented to the court is reliable. FSS sites contain material of evidential value; quantities of valuable items such as scientific and computer equipment; and sensitive items such as controlled drugs and firearms. Arrangements to ensure the safe custody of forensic evidence in the care of the FSS are necessary to counter possible threats to security. The BSI quality assurance registration requires the FSS to keep items safe from damage, theft and arson.

**4.2** This part of the report examines:

- the risks of forensic evidence being lost or damaged;
- the effectiveness of the FSS's arrangements and procedures to prevent the loss, damage or contamination of forensic evidence in its custody; and
- management and other independent checks of security.

**4.3** We focused on potential weaknesses in custody arrangements, and identified some areas for improvement which are outlined below. Generally, however, our findings were not such as to call into question the effectiveness of the FSS's arrangements in relation to the integrity of the evidence in its care.

### The risks to forensic evidence

#### *Main findings*

---

The main risks to forensic evidence arise from the potential theft, loss, contamination or deterioration of items in the FSS's custody. Consequential losses could damage the criminal justice system through loss of credibility of the FSS.

---

**4.4** The main risks to forensic evidence are:

- attempts by the criminal community to steal, destroy or tamper directly with evidence, or with the equipment holding the results of the analyses;

- the theft of high risk or valuable items such as firearms and drugs, whose circulation is restricted as a matter of public policy;
- the inadvertent loss or contamination of items and samples; and
- the deterioration of perishable items, such as biological samples.

**4.5** Where forensic evidence in the custody of the FSS is lost or damaged, the operation of the criminal justice system may be adversely affected in the particular case concerned, or more generally if the nature of the loss or damage could cast doubt on other cases not directly affected. The Crown Prosecution Service particularly emphasised the damage which could potentially be caused to the criminal justice system through any loss of credibility of the FSS.

## **Arrangements to prevent the loss, damage or contamination of forensic evidence**

**4.6** We examined the arrangements for the safe custody of forensic evidence at each of the sites visited. The results of the examination are shown in Figure 36 and discussed below in relation to each of the risks identified in paragraph 4.3.

### **On preventing theft or damage to evidence**

#### *Main findings*

---

The FSS has guidelines to counter the risk of damage to or loss of forensic evidence, and those concerning access to sites are generally being followed. There is a need to improve arrangements for storing and recording the movement and location of items in the FSS's custody, and the FSS is taking action to address this.

---

**4.7** Every item in the FSS's custody is of value to the criminal justice system and therefore needs to be protected from possible theft or damage. Guidelines to counter these risks are documented in the Quality Management System (paragraph 3.3). The FSS's staff are expected to comply with measures designed to protect the security of buildings and computer systems in order to preserve the integrity of exhibits, documents and other information, and in order to provide a secure working environment for employees. The guidelines cover control of access to FSS premises; security of documents; security of drugs; guidance notes on document security classification; security clearance for contractors; security aspects of the procurement and use of information technology; and storage of perishable items. They refer in general terms to the need for "appropriate physical

**Results of our review of  
security measures at FSS  
laboratories**

**Figure 36**

*Half of the key security measures we reviewed were found to be operating fully in all sites. The remaining measures were not operating fully in all sites at the time of our review, though in most cases more limited procedures were in place. Subsequent action by the FSS to tighten procedures is described elsewhere in Part 4.*

<b>Key security questions</b>	<b>Number of FSS laboratories in which security procedures were noted as operating fully</b>
<i>Physical security of the premises</i>	
1. Were the premises alarmed?	6
2. Was there a security guard presence out of work hours?	6
3. Were potential intruders prevented from viewing the interior of the building and the nature of the work undertaken?	2
<i>Access to the premises</i>	
4. Was access to the premises controlled, for example, through a reception area?	6
5. Were all visitors always escorted within the laboratory?	1
<i>Internal security</i>	
6. Were all items received checked against supporting documentation?	6
7. Was there an assigned general storage area (exhibits store) for items submitted by customers?	6
8. Was access to storage areas restricted to stores management staff	
a) during the day	0
b) outside working hours	6
<i>Controls over dangerous or harmful items</i>	
9. Were there adequate and appropriate storage areas for high risk items?	2
10. Was access adequately restricted in the more sensitive areas of the laboratory?	3

continued...

**Results of our review of security measures at FSS laboratories**

**Figure 36**

*Controls over dangerous or harmful items continued...*

11. Were items being worked on and their associated case files always held within fire and thief resistant cabinets overnight?	0
12. Were stock control records maintained and safeguarded which show the location of items received into the laboratory?	0 <sup>1</sup>

*Review of security arrangements*

13. Was there an annual internal audit of security arrangements?	6 <sup>2</sup>
14. Had there been a full independent review of security within the last three years?	6 <sup>3</sup>

*Security breaches*

15. Were records maintained of security breaches which detail the circumstance of the breach and remedial action taken?	0
---	---

*Disaster planning*

16. Were there plans in place to provide for the immediate aftermath of a disaster at a laboratory?	0 <sup>4</sup>
---	----------------

- Notes:
1. One laboratory was in the process of developing a stock control system
  2. Not undertaken in 1996-97 at two laboratories
  3. At one laboratory there was an examination of storage and security of drugs items without a full review.
  4. The FSS operates a policy of spreading capability across sites so that casework can be moved if necessary.

Source: Our fieldwork at FSS laboratories; HM Customs and Excise security guidance and Appendix A of C&AG's Report, HM Customs and Excise: Custody and Disposal of Seized and Detained Goods, HC 356 Session 1991-92.

security” and “sufficient secure storage”. The FSS commissions external experts such as the Security Facilities Executive, an agency of the Cabinet Office, and the police to advise on security arrangements.

**4.8** All FSS sites restrict entry to their premises. FSS staff have identity cards which must be shown on entry and worn at all times. Daily visitors are not allowed onto the site until the purpose of their visit has been verified. They are issued with visitors' passes which have to be handed in on leaving the premises, and they should be accompanied at all times by a member of FSS staff. Temporary identity cards allowing unaccompanied access are provided to contractors and casual staff who have been security cleared by the Home Office. These procedures were generally being followed at all the sites, but we noted occasional examples of non-compliance, such as people with a visitor's pass not always being escorted. We drew these and further weaknesses in security arrangements to the attention of FSS management, and the FSS has taken action, including tightening up of arrangements for escorting visitors.

**4.9** Staff are expected to note the movement of items on case files, and for continuity purposes individual scientists are identified and noted as responsible for the items and the case file. Our review of a sample of cases found that in 40 per cent of all cases examined and 74 per cent of drugs cases examined, the movement of forensic evidence exhibits was not being recorded. Items removed from store for analysis were not always returned at the end of the day, but were left out on shelving at the scientists' workbenches, or in scientists' filing cabinets, leaving them more vulnerable to theft, damage or contamination than would otherwise have been the case. Similarly, case files were not always stored away overnight. The FSS is now monitoring compliance with its policy to ensure proper overnight storage of items and case files, and has plans to improve the tracking of movement of items and case files, outlined in the next paragraph.

**4.10** We found that none of the FSS sites was maintaining a central register of the forensic evidence items held and their current location. Such a register would enable staff to know easily what items were being held and where at any given time; how long the items had been held and whether they were awaiting return to customers; to trace the location of items within the site; and to know quickly the extent of any losses in the event of a disaster. The registers would need to be supported by periodic stocktakes. Figure 37 outlines good practice in control of stores. A review undertaken by FSS staff of the items at the Metropolitan Laboratory awaiting return to the police found some items dating from 1983 taking up scarce storage space. At the time of our examination the FSS was developing a new stock control system for items in its custody which will be piloted in the Metropolitan Laboratory, and is planned to be extended to the other FSS sites during 1998-99.

**Good practice in control  
of stores**

**Figure 37**

- Numbering of items on receipt to enable items to be monitored
- Accurate records of items held in store and movements within laboratories
- Periodic physical counts by persons independent of stores recording to ensure all items are accounted for, and to detect where items are being moved without recording
- Stock records matched on a regular basis with items in store or being worked on
- Physical controls over access to storeroom to prevent stocks being lost or stolen
- Periodic review of items approved for disposal to identify those held longer than necessary and taking up storage space
- Properly organised storage arrangements to prevent avoidable damage

Source: National Audit Office

---

### **On preventing the theft of high risk or valuable items**

---

#### *Main findings*

There are guidelines for restricting access to the more sensitive parts of FSS sites and for the movement of items. The sites have separate secure storage areas for high risk and valuable items. Guidelines were being followed in some areas, but we drew attention to some weaknesses in arrangements and the FSS is taking measures to address them.

---

**4.11** Access to the more sensitive areas, such as areas where drugs are examined and forensic evidence is stored, is intended to be restricted to those members of staff whose duties require them to be there. In addition, FSS guidelines require entrances to drugs examination areas to be secured by a mechanical keypad or electronic coded lock during working hours. The guidelines were being followed in some areas, but in others, for example some drug examination areas, keypads and locks were not activated at all times during the working day.

**4.12** The FSS's guidelines on the storage and movement of forensic evidence items and documentation require items to be stored and transported in a way that prevents theft, damage, deterioration or contamination. Drugs storage areas should be locked except when items are deposited or removed; and there should be sufficient, secure storage for the volume of work likely to be in hand. The requirement for drugs to be held in sealed packages was being adhered to, but we noted some weaknesses in storage arrangements.

**4.13** We drew these findings to the attention of FSS management, and the FSS is taking measures, for example to ensure that controls on more sensitive areas and items operate efficiently.

### **On maintaining the integrity of evidence**

#### *Main findings*

---

There are documented procedures to ensure the integrity of evidence submitted by customers; these appear to be working satisfactorily. Known incidents of forensic evidence being contaminated when in the FSS's custody are rare.

---

**4.14** Much of forensic science involves the examination of trace amounts of material from scenes of crime such as glass, paint, hairs, fibres, explosives, blood and other body fluids. It is therefore vitally important that every precaution is taken, from the moment of its collection at the crime scene to the completion of its laboratory examination, to ensure that the integrity of evidence is maintained. We examined the FSS's measures to make customers aware of best practice in submitting items for examination so that integrity is not compromised prior to receipt, and its own arrangements to ensure that once evidence is submitted it is not lost, damaged or contaminated.

**4.15** Forensic scientists have a duty to ensure that the integrity of items submitted to them has not been compromised (Figure 34). We observed arrangements at all six sites to reject items where the packaging was inadequate or where there were other doubts about the integrity of the evidence collected. Staff who book items in need to have a comprehensive knowledge of the kinds of packaging which are suitable for different kinds of evidence. Actual rejections are rare. In 1996-97 there were 59 rejections across all six sites. These largely related to inadequate documentation for items received and poor packaging. For example, in one case fragments of glass taken from the suspect and possibly linking the suspect to the scene of crime were rejected as they had been placed by the submitting police force next to a control sample of glass taken from the scene of crime, which compromised the integrity of the evidence submitted.

**4.16** We found there were no formal procedures for scientists to feed back to customers information on the general integrity of their submissions, although at two of the sites staff had recently developed informal mechanisms. Scientists were encouraged to report problems to a specialist advisor or the appropriate account manager who then looked at the customer's general performance before taking the matter up with them. The FSS also provides, on request, advice and training to the

police and scene of crime officers on the precautions to be taken to avoid contamination of evidence at the crime scene and in the collection and preservation of evidence.

**4.17** The FSS's Quality Management System sets out procedures for undertaking scientific analysis in a way which minimises the risk of evidence being contaminated. By following the Quality Management System, the incidence of contamination of items once they arrive at FSS sites should be very small. Access to work areas for DNA testing is highly restricted because of the dangers of contamination of samples, and the FSS undertakes environmental monitoring to check that background levels of potential contaminants of significance in the laboratory are kept under control. No central record is maintained of contamination incidents, although the FSS told us that four incidents occurred during the 18 months to December 1997, three arising internally and one arising externally with the suppliers of the kits used for the taking of specimens for blood alcohol analysis.

**4.18** The FSS's Chief Scientist examines all contamination incidents to determine the cause and the appropriate corrective actions to prevent similar incidents occurring in future. For example, in respect of the three internal incidents, which occurred in the DNA analysis area, the FSS immediately stopped work in the affected areas, the source of the contamination was identified and a rigorous decontamination programme undertaken. The FSS then re-equipped the laboratory with fresh consumables, gloves and laboratory coats. Samples from the DNA batch affected by the incident were re-analysed from the start of the process. Following the incidents, the FSS put in place two new quality procedures:

- a formal documented process for handling future contamination incidents involving a "troubleshooting" committee of scientists; and
- a programme of environmental monitoring whereby laboratories are periodically examined for background contamination.

**4.19** Where the FSS learns of problems experienced in the scientific laboratories of other organisations, it takes action to check that the FSS complies with relevant good practice. For example, the FSS examined the 1996 report following contamination at the Forensic Explosives Laboratory to see whether there were implications for FSS's work. Since the FSS examines few explosives cases, the majority of the report's recommendations were not found to be relevant, but equipment used for examination of explosives material was checked for contamination and none was found.



## On the safeguarding of perishable items

### Main findings

---

All FSS sites have facilities for receiving and storing perishable items. The Quality Management System requires regular monitoring and this identifies occasional breaches.

---

**4.20** The FSS's Quality Management System has prescribed standards and procedures for the receipt and storage of perishable items, such as blood samples and other biological materials, to prevent their deterioration before they have been subject to scientific analysis. Normally, where a case involves perishable items or volatile materials such as accelerants, the FSS takes immediate action to examine the items. Biological materials submitted to the FSS for analysis are required to be stored in freezers at an appropriate temperature.

**4.21** Our examination found that all sites have facilities for storing perishable items in a safe and controlled environment such as a refrigerator or freezer. The FSS's Quality Management System requires the temperatures of refrigeration equipment to be monitored regularly. During 1996-97 the FSS's quality management checks found 10 instances where the temperatures of some refrigerators and freezers were not monitored regularly by FSS staff, or where records of the monitoring had not been maintained. On two occasions, the FSS's checks found that the temperatures of refrigeration equipment containing forensic evidence had been allowed to fall outside appropriate tolerance levels. The FSS investigated and found these to be minor deviations of no practical significance for the materials in the refrigerators. Staff were nevertheless reminded of their responsibilities for monitoring and the action to be taken where temperatures fall outside tolerance levels.

## Management and other independent checks

### Main findings

---

Several serious security breaches have occurred. One of these, an arson attack at the Wetherby site, destroyed items of forensic evidence and had severe financial consequences which were partly responsible for the FSS not meeting its financial targets in 1996-97 (Figure 1).

The FSS commissioned independent reviews of security in 1991 and 1996. Both concluded that there was a need for improved security at FSS sites. The FSS took limited action following the 1991 review, but has already acted on some of the recommendations of the 1996 review. At the time of our examination, the FSS had set an action plan to improve physical security and security practices over the three years from 1997.

---

## Security breaches

**4.22** In the last two years, there have been eight known serious security breaches (Figure 38). The FSS's Quality Management System does not require a record of security breaches to be maintained. None of the individual sites had a log of security breaches, and there was no central record. Managers responsible for security therefore lacked information to enable them to identify recurrent problems and weaknesses, to assess the extent of risks to security, and to provide information for decisions on appropriate measures to reduce those risks. The FSS has since established a central record for this purpose.

### Security breaches at the FSS

#### Figure 38

##### Arson

In November 1996, the Wetherby site was subject to arson. The attack, which appeared to be a determined attempt to destroy the premises, occurred at night when they were closed. Significant damage was caused, particularly to the section dealing with DNA evidence. The damage to buildings and equipment was estimated at £750,000. Some 200 criminal cases the FSS was working on were damaged by the incident, and whilst in the majority of instances there was further evidence available to support the police investigation, in 40 cases all the available forensic evidence was destroyed. The FSS has since improved the physical security of storage areas at Wetherby by constructing new strong rooms.

##### Thefts of drugs

During July to August 1996, there were at least three incidents in which drugs were stolen from the Metropolitan Laboratory. In total, some 22 blocks (approximately 6 kilograms) of cannabis resin and 40 capsules of suspected controlled drugs could not be accounted for. The incidents were in part due to staff not following prescribed procedures; in two cases the items had not been securely locked away at night. Following these thefts, the Laboratory took steps to tighten security including for example, the introduction of swipe card access controls to the drugs examination area and a new, more secure storage area for drugs seized by HM Customs and Excise.

In August 1996, an agency member of staff working at the Aldermaston site (now closed) was arrested by the police attempting to sell drugs, some of which he had stolen from the laboratory. The individual concerned was subsequently convicted of theft and possession with intent to supply.

##### Thefts of computer equipment

In 1996, there were three separate thefts of computer equipment from FSS sites. Two occurred at Birmingham involving the loss of a small number of computers from loading bays in February 1996 and a portable computer from the DNA unit reception area in August 1996. In the third incident, the central processing unit of a computer was stolen from the DNA unit at the Metropolitan Laboratory in December 1996.

Source:  
Forensic Science Service

## Security reviews

**4.23** The FSS's Quality Management System requires the work of the FSS to be audited against the requirements of the Quality Manual. Security should be audited annually, but while four sites had carried out audits during 1996-97, two had not. Through its security plan, the FSS will now be ensuring that all sites are audited regularly.

**4.24** The FSS's Quality Management System does not require the commissioning of regular independent reviews of security arrangements by external bodies. Two such reviews have however been commissioned, the first in 1991 undertaken by the Home Office Crime Prevention Centre and the second in 1996 undertaken by the Security Facilities Executive. Each review concluded that there was a need for improved security within FSS sites and to safeguard premises. For all sites the local police are consulted on their likely response time for any incident at the site, and in two cases this led to the commissioning of security reviews by local police forces. These two reviews also raised concerns and recommended improvements.

**4.25** The FSS took limited action on the recommendations of the 1991 review. It has however accepted the recommendations of the 1996 review and has begun to take action. Progress in some areas involves substantial capital expenditure, for example the hardening of premises.

**4.26** At the time of our examination, the FSS was taking further actions to improve the general level of security at its sites. Its action plan to improve physical security and security practices over the three years from 1997 takes account of most of the recommendations of the recent security reviews, consultation with local police forces and the findings of this examination. The plan includes:

- further upgrading of security and security controls at four of the six sites;
- periodic risk assessments and security audits;
- enhanced security of drugs;
- reviewing and updating of security guidance for staff;
- disciplinary action against staff who fail to follow security procedures; and
- contingency plans to minimise the impact and disruption to the service caused by a security breach.

**4.27** The FSS has already put in place some of the more straightforward remedies to the problems raised by our examination. For example, there are spot checks to ensure that staff are adhering to security procedures, and security breaches must now routinely be reported to FSS headquarters.

# Appendix 1

## Organisation structure: the main management committees

**Executive Committee**, chaired by Chief Executive and responsible for the day to day management of the FSS. Membership comprises:

- Research and Development and DNA Services Director
- Operations Director
- Law Enforcement Business Director
- Finance Director
- New Law Enforcement Manager
- Human Resources Manager
- Communications Manager
- Corporate Marketing Manager

**Corporate Quality Committee**, chaired by Law Enforcement Business Director and responsible for the management of quality within the FSS. Membership comprises:

- Law Enforcement Business Director
- Chief Scientist
- Research and Development and DNA Services Director
- Operations Director
- Human Resources Director
- Quality Systems Managers
- Analytical Services Manager

**Audit Committee**, chaired by FSS Non-Executive Director and responsible for the management of audit and corporate governance within the FSS. Membership comprises:

- FSS Non-Executive Director
- Chief Scientist
- Operations Director
- Finance Director
- Head of Internal Audit (Home Office)

## Appendix 2

### Sampling methodology for case examination

**1** Our examination focused on the quality of service provided by the Forensic Science Service (FSS) to its customers in the criminal justice system and how well the requirements of customers are met (paragraph 2.1).

**2** We sampled 216 cases from those submitted to the FSS by 20 police forces in 1996-97. The forces selected had submitted 62 per cent of all cases sent to the FSS for scientific analysis in 1996-97. The cases selected related to specific criminal offences where the police required FSS assistance and often involved a number of scientific tests. We reviewed:

- the FSS's and customers' views of the effectiveness of the work undertaken;
- the speed of delivery of the results of forensic science analysis; and
- the extent of communication between the FSS and customers.

**3** The sample, agreed with the FSS, was selected to:

- ensure that cases were sampled from police forces of differing sizes across England and Wales;
- provide a reasonable coverage of police forces using each of the seven FSS sites then operating; and
- broadly reflect the range of cases submitted to the FSS during 1996-97.

#### Police forces selected

**4** We selected a sample of 20 of the 43 police forces in England and Wales (Figure 11), to represent:

- each of the eight "families" of police forces, these are grouped according to size of force by Her Majesty's Inspectorate of Constabulary; and

- the work undertaken across the seven sites in 1996-97. We selected the Metropolitan Police, the main user of the Metropolitan Laboratory, and at least three forces primarily using each of the other six laboratories (including Aldermaston which closed in March 1997).

The 20 police forces selected were also asked for their views on the service provided by the FSS via a questionnaire survey (Appendix 3).

### Cases selected

**5** In 1996-97 the FSS processed some 66,000 cases excluding blood alcohol tests which involve very routine scientific analysis and work for public and private sector organisations other than the police. We selected a random sample of 216 cases evenly spread across the 20 police forces from the FSS’s computerised records of cases received. This provided a representative sample by service type of the cases processed by the FSS (Figure 39).

#### Sample of cases

**Figure 39**

Service type	Percentage of population	Sample	
		Number of cases	Percentage of sample
Drugs	40	82	38
Volume Crime	39	84	39
Serious Crime	14	39	18
Analytical Services	7	11	5
<b>Total</b>	<b>100</b>	<b>216</b>	<b>100</b>

Source: National Audit Office

Note: 1. Population based on 66,000 cases submitted to the FSS during 1996-97, excluding blood alcohol tests and UK public/private sector and international work.

## Appendix 3

### Survey of police forces

As part of the examination, we conducted a survey of 20 of the 43 police forces in England and Wales to obtain their views on the quality of service provided by the FSS. The methodology for selecting the forces is described at Appendix 2.

We received responses from all 20 forces contacted. The survey covered:

- background information on the forces' use of forensic science in the investigation of crime;
- arrangements for the collection and submission of items for scientific analysis;
- the timeliness of the FSS's work;
- standards of communication;
- the usefulness of the FSS's work; and
- the extent and nature of training provided by the FSS.



# Appendix 4

## Reference panel

---

Jeremy Colman	Director, National Audit Office
Kate Flannery	Associate Director, Audit Commission
Ben Gunn	Chief Constable of Cambridgeshire Constabulary and spokesman on forensic science for the Association of Chief Police Officers' Crime Committee
Trevor Howitt	Director of Law Enforcement Business, Forensic Science Service
Professor Trevor Jones	Director General, Association of British Pharmaceutical Industry
Peter Lewis	Head of Casework Services Division, Crown Prosecution Service
Barry Webb	Home Office Police Research Group

---