Final Report of the Independent Investigator for the Houston Police Department Crime Laboratory and Property Room

Michael R. Bromwich
Independent Investigator
Fried, Frank, Harris, Shriver & Jacobson LLP
1001 Pennsylvania Avenue, N.W., Suite 900
Washington, D.C. 20004
202.639.7000
http://www.hpdlabinvestigation.org

June 13, 2007

Investigative Team

Independent Investigator

Michael R. Bromwich
Fried, Frank, Harris, Shriver & Jacobson LLP

Fried Frank Team

Tommy P. Beaudreau
Piper M. Hendricks
Beth C. McClain
Jennifer M. Wollenberg
Michelle Hand-Arevalo
Joshua Cowdery
Coleman Hinnant
Charmain Ho-A-Lim

Scientific Advisory Board

Margaret C. Kuo
Orange County Sheriff-Coroner's Office (ret.)

Douglas M. Lucas, D.Sc. (hon.)
Centre of Forensic Sciences of the Province of Ontario, Canada (ret.)

Bruce W. Vander Kolk
Illinois State Forensic Sciences Command (ret.)

Forensic Scientists

Jeanine M. Baisch, Ph.D.
Independent Consultant

Robert P. Bianchi
DEA Special Testing and Research Laboratory (ret.)

Roger J. Bolhouse
Michael Sinke
Speckin Forensic Laboratories

Michael A. Evans, Ph.D.
American Institute of Toxicology Laboratories

Patricia P. Hamby
International Forensic Science Laboratory and Training Centre

Edward E. Hueske
Arizona Department of Public Safety (ret.)

Karen L. Irish
Forensic Services Section, Baltimore County Police Department (ret.)

Rhonda Roby
Identity Quest LLC

Mark D. Stolorow
Rick W. Staub, Ph.D.
Orchid Cellmark

Theresa F. Spear
California Department of Justice, Bureau of Forensic Services (ret.)

Statisticians

Jessica Pollner, Ph.D.
Arthur Baines
Kerri-Ann Cullinan
PricewaterhouseCoopers LLP

Executive Summary

This is the Final Report of the Independent Investigator for the Houston Police Department ("HPD") Crime Laboratory and Property Room. This report includes the final findings and recommendations of the independent investigation that began in April 2005. Accordingly, this report incorporates information that was discussed in our previous five reports, as well as a substantial amount of new material that has not previously been published.[1]

The City of Houston (the "City") and HPD commissioned this investigation following a two-year wave of adverse publicity that began in November 2002 and raised serious questions about the quality of the forensic science work in the Crime Lab. The City and HPD should be commended for authorizing an independent and public assessment of the extremely serious historical problems that have generated so much adverse publicity for the Crime Lab and for HPD and have created profound doubts about the integrity of important aspects of the criminal justice system in Harris County. It should serve as a model as to how to responsibly address failures of critical institutions in the criminal justice system.

Our investigation has gone well beyond examining the causes of the historical problems in the Crime Lab to include a detailed assessment of how the Lab's past problems have been addressed through the changes implemented in the Lab's current operations. We have also developed specific recommendations as to how HPD and the Crime Lab should make further improvements.

The goals of the investigation and of this final report are to (1) provide a thorough and detailed account of the management and operational issues that contributed to the crisis experienced by HPD and the Crime Lab; (2) identify potential cases of injustice resulting from flawed or misleading forensic science work performed in the past by the Lab; (3) thoroughly examine and assess the scientific and administrative problems related to the Lab's work across all of its sections, focusing primarily on cases worked during the 1998-2004 period but extending more broadly with respect to certain forensic disciplines, especially serology; (4) provide a comprehensive assessment of the current operations of the Lab and Property Room; and (5) formulate recommendations designed to ensure that the Lab and Property Room meet the public's legitimate expectations that the Lab and Property Room contribute to

---

[1] All six of the reports of the independent investigation are posted on our Web site at www.hpdlabinvestigation.org.

the maximum extent possible to the fair administration of criminal justice in Harris County.

To HPD's credit, the Crime Lab has moved forward during our investigation. Between the start of the independent investigation in April 2005 and the completion by May 2006 of the bulk of our historical case reviews, the Lab underwent significant advances and made significant progress in shedding its troubled past and building on changes that had begun as early as 2003. Under the leadership of the current head of the Crime Lab, Irma Rios, the Lab has revised the Standard Operating Procedures ("SOPs") for each of its sections, implemented a new quality assurance and quality control ("QA/QC") program, developed new training programs for analysts, and hired a number of new supervisors and analysts, including a qualified DNA technical leader. On May 10, 2005, the American Society of Crime Laboratory Directors/Laboratory Accreditation Board ("ASCLD/LAB") accredited the Crime Lab, for the first time, in the disciplines of controlled substances, blood alcohol analysis, questioned documents, firearms, and serology. In June 2006, after substantial preparation that included recruiting and training a new class of DNA analysts, ASCLD/LAB granted the Crime Lab provisional accreditation for DNA analysis, which allowed the Lab to resume forensic DNA profiling work. The Crime Lab underwent another ASCLD/LAB accreditation inspection in March 2007, which included a review of the status of the Crime Lab's DNA operation, as well as ASCLD/LAB's first inspection of the Lab's trace evidence examination work. On June 11, 2007, the Crime Lab reported that it had received notification from ASCLD/LAB that accreditation had been granted to the Crime Lab's operational units.

In light of the significant changes implemented by HPD and the Crime Lab during the 2003-2005 period, our investigation was broadened to include a review of the Lab's current operations. In order to furnish the City and HPD with relevant and specific recommendations designed to enable the Crime Lab and Property Room to provide the people of Houston with first-rate forensic science services, we reviewed cases processed by the each of the Lab's sections since ASCLD/LAB accreditation was obtained in May 2005, as well as policies and practices related to the current management and administration of the Lab and Property Room.

Our two-year investigation of the Crime Lab covered a period of more than 25 years, included more than 100 interviews, and involved the review of more than 3,500 forensic science cases analyzed by the Lab. During the course of our investigation, we developed an enormous body of information about the collection, storage, analysis, and use of forensic evidence in the Harris County criminal justice system. The findings and recommendations contained in this report are designed to fairly and objectively assess the past, evaluate the present, and recommend reforms that will assist the City and

HPD in providing the best possible forensic science services to the people of Houston and Harris County.

I. The Independent Investigation

Our investigation of the Crime Lab and Property Room, as reflected in this report, had three central elements:

1. Historical operations of the Crime Lab. We gathered and analyzed facts regarding the historical management, administration, and operations of the Crime Lab. This analysis included a review of more than 3,500 cases covering the disciplines of serology, DNA analysis, trace evidence examination, controlled substances, firearms examination, toxicology, and questioned documents examination. The central task was to assess the quality of the forensic science work prior to accreditation.

2. Serology incarceration cases. We identified and reviewed all of the serology cases related to still-incarcerated defendants that were processed by the Crime Lab between 1980 and 1992, a total of 850 cases.

3. Review of the current operations of the Crime Lab and Property Room and recommendations. We analyzed the current operations of the Crime Lab and Property Room, including the review of a sampling of cases analyzed by each section of the current Crime Lab since accreditation in May 2005. Based on that review, we developed recommendations regarding the collection, storage, analysis, and use of forensic evidence.

II. The Historical Operations of the Crime Lab

Our review of over 3,500 cases analyzed by the Crime Lab prior to its accreditation by ASCLD/LAB has produced a rich and complex portrait of the quality of forensic science work performed during a period that extended, in some of our reviews, for a period of close to 25 years. We observed high quality work performed in the Crime Lab's Toxicology, Firearms, and Questioned Documents Sections and found very few significant problems in the cases we reviewed in these disciplines. Although the Crime Lab generally performed reliable examinations of trace evidence, we found that poor communication between the Crime Lab and HPD investigators may have diminished the potential value of this work to HPD's investigations. Although the Controlled Substances Section's analysis of marijuana and cocaine samples -- which comprised the vast majority of its workload -- was sound, we found a number of serious problems with the Section's analysis of other types of evidence including liquids and tablets.

By stark contrast with the overall quality of work performed in these sections of the Crime Lab, the Lab's historical serology and DNA work is, as a whole, extremely troubling. We found significant and pervasive problems with the analysis and reporting of results in a large proportion of serology and DNA cases. The Crime Lab's substandard, unreliable serology and DNA work is all the more alarming in light of the fact that it is typically performed in the most serious cases, such as homicides and sexual assaults. On the whole, this work did not meet the generally accepted forensic science principles that existed at the time and posed major risks of contributing to miscarriages of justice in extremely significant cases, including death penalty cases.

A. Results of the Historical Case Reviews

Our team developed appropriate sample sizes for the historical case reviews undertaken by our forensic scientists in each of the following forensic science disciplines:[2]

- DNA (1992 – 2002)
- Trace evidence (1998 – 2004)
- Firearms (1998 – 2004)
- Controlled substances (1998 – 2004)
- Toxicology (1998 – 2004)
- Questioned documents (1998 -2004)[3]

1. DNA

We reviewed a total of 135 DNA cases analyzed by the Crime Lab between the early 1990s and December 2002, when the DNA Section of the Lab was closed following an outside audit. We identified major issues in 43 -- or approximately 32% -- of these cases.[4] We reviewed all 18 of the death penalty cases that involved DNA analysis performed by the Crime Lab prior to the closure of the DNA Section. We identified major issues in the DNA analysis performed by the Crime Lab in four death penalty cases involving death row inmates Franklin Dwayne Alix, Juan Carlos Alvarez, Gilmar Alex Guevara, and Derrick Jackson.

---

2 In addition to the Crime Lab's historical cases in each of these six disciplines, we reviewed over 1,000 serology cases processed by the Crime Lab between 1980 and 1992. The results of this review are summarized in Section III below.

3 Because of the relatively small number of questioned documents cases, we reviewed all of HPD's questioned documents cases examined between 1998 and 2004.

4 There are 45 suspects or defendants involved in the 43 major issue DNA cases we identified. Each of these individuals is identified in Appendix E, "DNA Major Issue Cases."

The Crime Lab's historical DNA casework reflects a wide range of serious problems ranging from poor documentation to serious analytical and interpretive errors that resulted in highly questionable results being reported by the Lab. The profound weaknesses and flawed practices that were prevalent in the Crime Lab's DNA work include the absence of a quality assurance program, inadequately trained analysts, poor analytical technique, incorrect interpretations of data, the characterizing of results as "inconclusive" when that was not the case, and the lack of meaningful and competent technical reviews. Furthermore, the potential for the Crime Lab's analysis of biological evidence to result in a miscarriage of justice was amplified exponentially by the Lab's reported conclusions, frequently accompanied by inaccurate and misleading statistics, that often suggested a strength of association between a suspect and the evidence that simply was not supported by the analyst's actual DNA results.

Despite all these problems, the Crime Lab continued for a full decade to perform DNA work under conditions that made the risk of an injustice intolerably high. Although most of the DNA results reported by the Crime Lab have been confirmed in some fashion by independent testing, 52 cases have not been, and, after more than four years of re-testing, many of them probably will never be. While the number of proven wrongful convictions attributable to the Crime Lab's DNA work is small -- only one such case, that of Josiah Sutton, has been established at this point -- the possibility of other wrongful convictions resulting from DNA analysis during this era cannot be dismissed.

2. Controlled Substances

We reviewed 1,271 of the Crime Lab's historical controlled substances cases, including samples that focused on cases analyzed by former Crime Lab analysts James Price and Vipul Patel, who were involved in four cases of "drylabbing."[5] We found a total of 147 cases involving major issues, most of which were due to a few common, widespread problems related to poor laboratory practices. Most of the minor issues we identified were attributable to a combination of analyst errors, poor documentation practices, and an informal review process and quality assurance program that was not sufficiently rigorous. In spite of these issues, however, we found that the bulk of the actual analytical work performed in the historical Controlled Substances Section --

---

5 "Drylabbing" is the most egregious form of scientific misconduct that can occur in a forensic science laboratory -- it means the fabrication of scientific results. In the Crime Lab, the instances of drylabbing took the form of controlled substances analysts creating false documentation intended to reflect analytical procedures that were never performed. As one of the members of the Stakeholders Committee put it, drylabbing is a "hanging offense" in the scientific community.

which predominantly were cocaine and marijuana identification cases -- was reliable and of high quality.

3. Firearms

We reviewed a total of 330 historical firearms cases and found that the work in the Firearms Section was consistently good and sometimes excellent. We identified only one case with a major issue, which involved the misreporting of an examiner's results. The Firearms Section has acknowledged the error and has taken remedial action through the Crime Lab's current QA/QC program. The various minor issues we found in the historical firearms cases were mostly administrative in nature, involving minor documentation deficiencies and deviations from Crime Lab policies or what are now generally accepted forensic science principles. These minor issues can be attributed to a combination of analyst errors and shortcomings in the Section's case review process and quality assurance program.

4. Trace Evidence

We reviewed 263 of the Crime Lab's past trace evidence cases, 5 of which involved major issues. While we found that most of the work performed by the Trace Evidence Section was of high quality, much of the potential value of trace evidence was not realized during this period because HPD investigators and the Crime Lab did not pursue potentially significant evidence. The follow-up that did occur often took place only after lengthy delays that reduced the likelihood of a successful investigative outcome. The Trace Evidence Section's sparsely documented files, which was an issue endemic across all of the Crime Lab's sections, also diminished the usefulness of the examinations performed by the Section.

5. Toxicology

We reviewed 396 toxicology cases and found only one that involved a major issue -- in that case, the analyst failed to perform additional testing to resolve a pharmacologically questionable test result. While most of the work performed by the Toxicology Section during the period of our review was of high quality, we identified some documentation deficiencies, a lack of rigor in the interpretation of some analytical data, and the absence of thorough administrative and technical reviews as minor issues in a significant number of the cases.

6. Questioned Documents

We were consistently impressed by the quality of the work performed by HPD's questioned documents examiner. Only minor issues were identified in our review of historical cases, and the minor issues were all administrative issues unrelated to the

technical proficiency of the questioned documents examiner. The most significant problem with the Questioned Documents Section has been its chronic underutilization by the Department -- HPD's lone questioned documents examiner performed substantive work in only 91 cases between 1998 and 2004, which is very surprising in a city as large as Houston.

B. Causes of the Crime Lab's Failure

Several of the root causes for the severe problems experienced by the Crime Lab came into focus early in our investigation when we reviewed information relating to funding and support for the Lab; interviewed Lab managers, Lab employees, and other HPD personnel; and reviewed the Lab's SOPs, administrative files, and casework. On the basis of that work, we arrived at various tentative conclusions about the causes of the crisis that consumed the Crime Lab beginning in late 2002. These tentative conclusions were borne out by our review of the Crime Lab's historical cases. Each of these causes had an impact on the Crime Lab's casework and the quality of forensic science services that the Lab was able to provide to the Harris County criminal justice system.

1. Lack of Support and Resources for the Crime Lab

Over the 15 years preceding the DNA/Serology Section's closure in December 2002, HPD and the City failed to provide the Crime Lab with adequate resources to meet growing demands for its services. During these years, Houston grew to become the fourth largest metropolitan area in the United States, and the level of criminal activity increased as the City grew. Yet, as its caseload swelled, the Crime Lab struggled to keep pace. As a support function populated by civilian employees, the Crime Lab was marginalized within HPD. Salaries for Crime Lab personnel were significantly lower than salaries offered in other laboratories, including other public laboratories in the Houston area. As a result, the Crime Lab experienced difficulty attracting and retaining well-qualified forensic scientists. Although the number of forensic scientists authorized for the Crime Lab grew modestly between 1994 and 2002, turnover or inadequate funding meant there were always positions that remained vacant, sometimes for extended periods of time. The calcified organization of the Crime Lab afforded analysts very little opportunity for promotions or pay increases.

With very few exceptions, the technical errors we identified in the Crime Lab's historical cases were not attributable to misconduct on the part of individual analysts. Rather, the major issues that we identified in the Crime Lab's historical casework are attributable in large part to poor training and lack of competent technical guidance. We found documents reflecting DNA analysts' frustrations and concerns over the lack of training as early as 1994, soon after the Crime Lab began performing DNA analysis.

Training was one of the first areas of the Crime Lab's budget that was cut as funding for the Lab became tight. This lack of training was reflected in the Crime Lab's DNA casework where HPD analysts demonstrated fundamental failures to understand and apply generally accepted forensic science principles.

Finally, under HPD's and the Crime Lab's former management, accreditation was never a realistic possibility. Because of the roof leaks that allowed water to leak into the Crime Lab for more than six years[6] and because of the lack of sufficient funding, by the early 2000s the former head of the Lab, Donald Krueger, knew that the Lab would not be able to obtain ASCLD/LAB accreditation without significant improvements. Mr. Krueger was uncomfortable with the prospect of inviting outside inspectors to review the Crime Lab. Without additional funding and support from HPD and the City, the Crime Lab had no realistic prospect of becoming accredited and integrated into the national forensic science community.

2. Ineffective Management Within the Crime Lab

Although HPD and the City must be faulted for failing to provide the Crime Lab with the resources it needed, there also was a lack of strong and effective leadership within the Lab. Mr. Krueger, who was head of the Crime Lab from 1995 to early 2003, was an isolated and detached director of the Lab. Mr. Krueger rarely met with Crime Lab analysts as a group, and he relied heavily on James R. Bolding, the head of the DNA/Serology Section, and the other managers to run their sections, while providing little oversight. Mr. Krueger told us that he was surprised and shocked when, in December 2002, outside auditors advised him that the DNA Section was in shambles. Given the state of affairs described by the auditors and reflected in the Section's casework, this could only have been the reaction of a manager extremely far removed from the work performed and reported out by the DNA Section.

For his part, Mr. Bolding almost surely lacked the competence to recognize the problems with the Crime Lab's DNA work -- he was never trained in polymerase chain reaction ("PCR") techniques and clearly had no better understanding of the proper interpretation and presentation of DNA typing results than his subordinates. Mr. Krueger failed to make a forceful case with HPD command staff for addressing

---

6 The City and HPD were aware of problems with the roof at the 1200 Travis Street HPD headquarters building before the Crime Lab moved into the facility in 1997. In 2001, Tropical Storm Allison flooded the Crime Lab, and boxes containing biological evidence became soaked and the evidence likely contaminated. Yet, the roof leaks continued unabated in a scientific laboratory responsible for processing sensitive biological evidence for use in criminal matters. The roof problem was not addressed until 2003, after the crisis enveloped the Crime Lab.

critical needs, such as the severity of the roof problem and the desperate need for a direct supervisor over the DNA/Serology Section. Although requests for funding were made regularly over the years, Mr. Krueger failed -- almost surely because he did not fully appreciate the problem himself -- to explain the disastrous potential of the lack of supervision in the DNA/Serology Section.

We also found that there was inadequate management of the strong and difficult personalities within the Crime Lab. Morale was consistently low among Crime Lab analysts and discontent was widespread. After Dr. Baldev Sharma was made the line supervisor over the DNA/Serology Section in 1993, open and prolonged feuding developed between Dr. Sharma and his supervisor, Mr. Bolding. Grievances and Internal Affairs Division ("IAD") complaints between and among analysts and supervisors, some of which were quite petty, were commonplace. Finally, as demonstrated by four drylabbing incidents involving two Controlled Substances Section analysts, described in our previous reports and again in this report,[7] Crime Lab managers found it difficult to discipline or remove incompetent personnel. These personnel problems fostered a highly dysfunctional, and, in some respects unprofessional, laboratory environment.

3. Lack of Adequate Quality Control and Quality Assurance

Managers and supervisors within the Crime Lab failed to ensure that the analytical and quality control procedures employed by the Lab were current, properly designed, and complete. SOPs for most of the sections in the Crime Lab, including the DNA/Serology Section, consisted of procedures and reference materials cobbled together over time without periodic re-evaluation and reorganization. There were few technical reviews of analysts' work, including review of their test results, interpretation of data, and reporting.

Even though Dr. Sharma was appointed the QA/QC Manager for the Crime Lab in 1996, he was unproductive in this position, and the Lab failed to develop a true quality assurance program. The Crime Lab stopped performing Lab-wide inspections of casework until approximately 1997, but those inspections even when performed were largely administrative and did not involve review of analysts' results and interpretation.

---

[7] These drylabbing cases were first discussed in our Second Report, which was issued on May 31, 2007. These incidents are described in detail in Section III.A of this report's discussion of our historical case reviews.

4. Isolation of the DNA/Serology Section

Major problems existed in the DNA/Serology Section of the Crime Lab almost from its inception in the early 1990s. These problems were insufficiently recognized by Crime Lab management and the HPD command staff for many years. By the time of the 2002 outside audit, the DNA Section was in shambles -- plagued by a leaky roof, operating for years without a line supervisor, overseen by a technical leader who had no personal experience performing DNA analysis and who lacked the qualifications required under the applicable Federal Bureau of Investigation ("FBI") standards, staffed by underpaid and undertrained analysts, and generating mistake-ridden and poorly documented casework. A critical component of the FBI standards, to which the Crime Lab agreed to abide when it registered to participate in the Combined DNA Index System ("CODIS") database[8] in 1998, is a requirement for bi-annual reviews by outside agencies. Such a review never occurred until the fateful outside audit in December 2002. The internal reviews of the DNA Section, performed by Mr. Bolding in 2000 and 2001, made findings regarding the condition of the Section that were largely contradicted by the 2002 outside audit, which used the same standards supposedly used by Mr. Bolding. Despite the Crime Lab management's recognition as early as 1996 that accreditation was becoming a necessity, the Lab's efforts toward achieving accreditation never gathered momentum of any kind; no outside inspection of the DNA Section related to accreditation was ever performed.

The purpose of outside scrutiny is to examine a laboratory's practices, to focus attention on existing deficiencies and potential problems, and to broaden the perspective of laboratory analysts by bringing them in contact with personnel who work in other forensic laboratories. By insulating itself from outside scrutiny, the Crime Lab never received these benefits. Flawed practices and embedded misunderstandings -- for example about the proper calculation and use of frequency estimates in DNA cases -- became accepted by analysts within the DNA/Serology Section as the correct way to do things. These misunderstandings infected the work of the Section's analysts from the analysis through trial testimony. Indeed, we observed the same types of major issues across all the Crime Lab's DNA work, regardless of the analyst or the DNA typing system used.

---

8 CODIS is a system that "enables federal, state, and local crime labs to exchange and compare DNA profiles electronically, thereby linking crimes to each other and to convicted offenders." CODIS is a hierarchical database with three tiers -- the National DNA Index System (NDIS) is the highest tier, with state (SDIS) and local (LDIS) databases flowing into it. *See* www.fbi.gov/hq/lab/codis/brochure.pdf.

III. Serology Case Reviews and Recommendations

During the 1980s and early 1990s, the forensic serology work performed in the Crime Lab under Mr. Bolding fell far below the principles generally accepted in the forensic science community at the time. The Serology Section failed the criminal justice system in Harris County both in the work that it did and in the work that it failed to do.

The Crime Lab failed to perform genetic marker testing, such as ABO typing and enzyme testing, on evidence in hundreds of cases submitted to the Lab -- testing that could have generated probative information about the culpability of suspects who had been identified by HPD investigators.[9] Our review of 850 serology cases handled by the Crime Lab between 1980 and 1992 -- each of which relates to a suspect who is currently incarcerated in a Texas prison -- found that there may be biological evidence in 274 -- i.e., one-third -- of these cases that was never typed by the Lab. In another 139 cases, the Crime Lab performed ABO typing on the evidence but never compared it to known reference samples from the victim and suspect, so the genetic marker data developed by the Lab was of no use. These 413 cases all involve evidence that, if properly analyzed using then-existing technology and compared to reference samples, could have been used to either help convict a suspect who was known to HPD or prosecutors or to help exonerate him. All of these cases relate to currently imprisoned defendants convicted of very serious crimes, such as murders and sexual assaults.

We found that the serology work that the Crime Lab did actually perform during the 1980-1992 period was generally unreliable. We found major issues calling into question the reliability of the serology work performed by the Crime Lab or the accuracy of the results it reported in 180 -- 21% -- of the serology cases we reviewed that relate to a defendant who is currently in prison. This is an extraordinarily high and extremely disturbing proportion of cases in which to find problems of this magnitude.

Based on the findings of our review of 850 serology cases processed by the Crime Lab between 1980 and 1992 and which relate to a defendant who currently is in prison, we make the following recommendations.

- HPD must determine whether evidence currently exists and can be located in the following categories of cases:

---

[9] Our review of the Crime Lab's historical serology cases was limited to those cases from the 1980s and early 1990s that could be tied to a currently incarcerated prisoner. The total number of cases from this period in which the Crime Lab found biological stains in evidence and could have performed serological genetic marker analysis likely is in the thousands.

(1) Cases (274) in which evidence was screened positively for blood or semen, but no ABO typing was performed;

(2) Cases (139) in which the Crime Lab performed ABO typing on evidence samples, but no comparison to known reference samples was made;

(3) Cases (6) in which DNA analysis performed contemporaneously by an outside laboratory failed to include the suspect; and

(4) All cases (180) we identified as containing a major issue with the reliability of the Crime Lab's work or the accuracy of its reported results.

- The District Attorney's Office and HPD should notify every prisoner whose case falls into one of the above categories that the independent investigation has identified a potential issue with the forensic serology work performed by the Crime Lab in his case and that HPD is attempting to locate any biological evidence that may relate to the prisoner's case. The District Attorney's Office and HPD should keep each prisoner who receives such a notice apprised of the status of the Department's efforts to locate biological evidence related to his case.

- In cases in which HPD is successful in locating evidence containing potential biological samples, the District Attorney's Office should notify the prisoner of the existence of this evidence, advise him that DNA testing could possibly be performed on the evidence, and ask the prisoner whether he wants DNA analysis to be performed on the evidence.

    - In cases in which the prisoner requests DNA analysis, Harris County and HPD should arrange for the analysis to be performed without cost to the prisoner.

- Harris County and the City should appoint a special master to review the complete investigative, prosecutorial, appellate, and post-conviction *habeas* record for all 180 of the major issue serology cases we identified that relate to a currently incarcerated prisoner as well as the 6 cases in which DNA testing already performed did not include the prisoner as a potential contributor of the evidence. The purpose of this review should be to determine (1) what role, if any, work performed by the Crime Lab played in the defendant's conviction and (2) whether DNA analysis of evidence in the case should be performed in order to substantiate the defendant's conviction, regardless of whether serology evidence processed by the Lab was used in the prosecution of the defendant.

- In cases in which the special master determines that DNA analysis should be performed to substantiate the conviction, Harris County and the City should arrange for the DNA analysis of evidence in the case without cost to the prisoner.

IV. Detailed Case Studies

In addition to our review of more than 3,500 pre-2005 Crime Lab cases, we conducted detailed reviews of the role forensic science played in the cases related to four defendants -- Lawrence Napper, George Rodriguez, Josiah Sutton, and Nanon Williams. Each of these cases has received substantial media coverage, and each involves work by the Crime Lab that has been called into question. The Rodriguez case involved serology and trace evidence examination; the Williams case involved firearms evidence; and the Napper and Sutton cases involved DNA evidence.

A. Lawrence Napper

The Napper case relates to the 2001 kidnapping and sexual assault of a young boy in which the Crime Lab analyzed samples taken from the outside of the victim's cheeks that the Lab found contained semen. Although the Crime Lab's original DNA testing appears to have generated good quality and clear results from potentially very difficult forensic evidence samples, the Napper case illustrates two significant problems with the Lab's historical DNA work. First, Crime Lab analysts utilized all of the readily testable sample in this case, which was unnecessary and was the product of very poor laboratory practice. Second, the written conclusion and testimony of the Crime Lab analyst that the mixture profile he found in the "face-cheek" swabs "statistically matches" Mr. Napper is internally contradictory and completely inappropriate. The analyst's report and testimony almost assuredly created the impression with jurors that Mr. Napper was the only person on earth who could have contributed the DNA taken from the victim's face, which is a conclusion not supported by his actual DNA results.

B. George Rodriguez

George Rodriguez was wrongfully convicted of the 1987 kidnapping and sexual assault of a 14-year-old girl, a crime for which he served nearly 17 years in prison before being released in 2004. Flawed serology work and testimony were central to Mr. Rodriguez's conviction. Based on seriously problematic serology analysis, the Crime Lab incorrectly excluded a key suspect whom investigative leads and Mr. Rodriguez's defense pointed to as the likely real perpetrator. While the Crime Lab was not incorrect in finding that its serology analysis could not eliminate Mr. Rodriguez as a potential contributor to the biological evidence, it provided no information regarding the significance of Mr. Rodriguez's inclusion -- which was minimal because

most of the male population could not be eliminated as a potential contributor to the evidence in this case based merely on ABO typing.

C. Josiah Sutton

Josiah Sutton was released from incarceration on March 12, 2003 after serving four and a half years of a 25-year prison sentence for a sexual assault that he did not commit. The Sutton case in many respects is a microcosm of the range of problems we observed during this investigation related to the use of forensic DNA evidence in the Harris County criminal justice system. The system failed at multiple points, with the result that Mr. Sutton was wrongfully convicted based largely on flawed and misleading DNA work. As a result of poor technique and lack of training, the Crime Lab analyst, using PCR testing, produced ambiguous results reflecting complex mixtures, the interpretation of which was very difficult. The problem was exacerbated by the Crime Lab's practice, followed by the analyst in this case, of failing to accurately convey the significance of the associations they found between suspects and evidence through DNA testing, particularly in mixture cases. Nearly eight years after the crime, the proper use of forensic DNA testing led to a CODIS hit and the conviction of the actual perpetrator.

D. Nanon Williams

Nanon Williams was convicted of capital murder in 1995 and is currently serving a life sentence. We reviewed his case because three Crime Lab firearms examiners misidentified potentially significant fired bullet evidence collected from the victim, and a Crime Lab employee provided testimony at Mr. Williams's trial based on the misidentification. Several factors contributed to the error, including: (1) distortion and fragmentation of the bullet evidence because of impacts after firing; (2) the failure of investigators to submit a suspect firearm to the Crime Lab for comparison to the fired bullet evidence; and (3) policies that, at the time the case was originally examined, permitted firearms examiners to co-sign reports of other examiners without personally reviewing the evidence that was the subject of the report.

V. Findings and Recommendations Regarding the Crime Lab's Current Operations

From the outset, the City Council, Stakeholders Committee, and HPD have emphasized the importance of our formulating recommendations for the Crime Lab.[10]

---

[10] We include an abbreviated set of our recommendations in this Executive Summary. The full set of our recommendations appears in the body of this report and in a separate Summary of Recommendations.

These recommendations are designed to serve two complementary purposes: (1) to assist HPD in establishing the Crime Lab as one of the preeminent law enforcement forensic laboratories in the nation and (2) to provide a means for holding HPD and the Lab accountable for the quality of forensic science services provided to the people of Houston. In order to adequately support relevant and useful recommendations, we performed a comprehensive review of all of the current functions of the Crime Lab.[11]

A. Management of the Current Crime Lab

The senior management of the Crime Lab, both in the HPD chain of command above the Lab as well as within the Lab, has undergone a total transformation since the problems infecting the Lab came to light beginning in November 2002. As reflected by, among other things, the commissioning of this investigation, the City and HPD Chief Harold L. Hurtt have made the rebuilding of the Crime Lab a top priority for HPD. Under Irma Rios's leadership, the Crime Lab has been re-organized, has hired and trained a number of new supervisors and analysts in all of its sections, has re-written all of its SOPs, and has obtained ASCLD/LAB accreditation in almost all of the areas in which it currently performs -- or plans in the near future to perform -- forensic science work.[12]

One of the most encouraging changes that we have observed since our investigation began in April 2005 is in the attitude and morale of the Crime Lab staff. Although many of the analysts are relatively young or new to their fields, we found them to be bright, professional, and enthusiastic about their careers as forensic scientists and about working in the Crime Lab. We were impressed by the high level of respect the Crime Lab has for Ms. Rios. We also found that analysts have confidence in their section supervisors and that, while there are various issues, as there are in every institution, analysts believe they are supported by their managers and treated fairly. These are extremely important baseline facts about the current Crime Lab that are welcome departures from the past and give hope for the future.

---

11 Despite the self-evident importance of having an accurate picture of the current operations of the Crime Lab to serve as the basis for formulating relevant recommendations, we originally encountered opposition from various quarters, including from HPD personnel, in obtaining the authorization and funding to review such operations. After a significant delay, the City Council approved the necessary funding, and we were permitted to move forward to complete this vital aspect of our work.

12 The sole exception is trace evidence examination, for which the Crime Lab received provisional DPS accreditation in November 2006 and underwent an ASCLD/LAB inspection in March 2007.

1. Personnel and Resources

The Houston Police Department Crime Laboratory Career Ladder, circulated to Crime Lab staff on August 19, 2005, significantly reorganized the Lab's personnel structure by reducing the number of criminalist positions from four to three. The Career Ladder included revised job descriptions for each of these positions and, in a significant improvement over the Crime Lab's historical salary structure, provided for merit pay increases. Moreover, on December 14, 2005, HPD's Human Resources Director approved significant pay grade enhancements for each of the criminalist positions under the revised Career Ladder structure.

Compared to its funding levels during the 1990s and early 2000s, the Crime Lab's budget has increased substantially. The Crime Lab's total budget from HPD's general fund in fiscal year 2006 was $7.66 million -- more than double the funds that had been allocated to it earlier this decade.[13] Significantly, the Crime Lab's 2006 budget includes line items reflecting that HPD has devoted funds for the training of analysts, including funds to attend training outside of the Lab.

Two areas of the Crime Lab still in need of additional resources, including additional staff, are the Firearms Section and Central Evidence Receiving ("CER"). Two of the Crime Lab's six positions for line firearms examiners currently are vacant, and the Firearms Section is experiencing a significant backlog of more than 600 cases. CER, which is the Crime Lab's central location for receiving, logging, and storing drug evidence, currently is significantly understaffed. CER is staffed by one criminalist, one evidence management clerk, and one contractor. Two additional evidence management clerk positions are vacant.

2. Quality Assurance and Quality Control

The importance of a robust QA/QC program in a forensic science laboratory cannot be overemphasized. In October 2003, Reidun Hilleman was appointed the QA/QC Manager for the entire Crime Lab -- a function that had never before truly

---

13 The Crime Lab's 2006 budget also includes $100,000 in asset forfeiture funds for equipment. This budget also includes nearly $2.7 million for management consulting services, a significant portion of which relates to funding for this investigation. Although our investigation has now been concluded and all of the sections of the Crime Lab have received some form of accreditation, funding for outside consultants should not be eliminated from the Lab's budget. We believe that the Crime Lab still has a significant need for outside technical consultants -- particularly in the areas of serology, DNA analysis, and trace evidence examination -- to assist the managers and staff of those sections with technical reviews and other quality assurance measures.

existed in the Lab. Since then, Ms. Hilleman has been central to HPD's and the Crime Lab's progress in the rebuilding of the Lab.

a. QA/QC Audits and Inspections

The Crime Lab's current Quality and Operations Manual requires the QA/QC Manager to perform annual laboratory inspections using the ASCLD/LAB accreditation criteria as the reference standards for the inspection.[14] This requirement is consistent with the Crime Lab's general orientation toward, and emphasis on, maintaining compliance with "objective standards," as embodied by the ASCLD/LAB accreditation criteria. The QA/QC Manager also performs spot reviews of cases analyzed in each of the Crime Lab's sections. As many other laboratories have found with respect to their own operations, additional staffing for the QA/QC function in the Crime Lab will become necessary.

b. Peer Technical Reviews

Thorough and competent technical reviews of the scientific analyses performed in each case are among the most important elements of any forensic laboratory's QA/QC program. The Crime Lab has adopted a technical review system that permits any analyst who has completed training and passed the required proficiency testing to perform technical reviews of other analysts' work in that area, regardless of the analyst's level of experience. This system also is reflected in the current organization of the Crime Lab, which has essentially abolished the historical Criminalist III line supervisor position in favor of a flattened structure that includes only three levels of criminalist positions: (1) entry level Criminalists, (2) more experienced forensic scientists at the Criminalist Specialist level, and (3) Criminalist Managers (who are the administrative and technical heads of the Controlled Substances/Toxicology Sections, the Biology/Trace Evidence Sections, and the Firearms Section, as well as the QA/QC Manager).

While such peer review systems for technical reviews are permitted under ASCLD/LAB's accreditation guidelines and are used in other forensic science laboratories across the United States, this system may not be appropriate for the Crime Lab at this stage in its recovery and development. Many of the Crime Lab's current forensic scientists -- particularly in the fields of DNA analysis and trace evidence examination -- either are currently undergoing training or have only recently completed training and have limited forensic casework experience. We are concerned about the expectations this technical review system imposes on analysts and examiners with

---

[14] Quality and Operations Manual, Section 300/1.01.

slender experience of their own in a crime laboratory whose work is likely to be under close scrutiny for some time as a result of the events of the past several years. High quality technical reviews require, in our judgment, seasoned judgment and substantial experience, ingredients not possessed by even the most talented young analysts.

c. Incident Reporting and Response

The Crime Lab's current quality assurance protocols require that, however they may be discovered, technical problems, deficiencies, or departures from accepted quality assurance standards must be immediately brought to the attention of the QA/QC Manager. We found that the Crime Lab program for reporting and documenting incidents affecting the quality of work performed is vastly superior to the virtually non-existent quality assurance function of the Lab as existed under the tenure of Mr. Krueger, which ended in early 2003.

3. Information Systems

The evidence tracking, case management, and laboratory reporting systems currently in use by the Crime Lab are archaic and very poorly suited to the information systems needs of a forensic laboratory. These are all problems of which HPD is aware, and plans are currently underway to provide the Crime Lab with a modern laboratory information management system ("LIMS"), which will be integrated with a Department-wide records management system ("RMS") that is in the relatively early stages of development.

The Crime Lab does not currently have an electronic system for tracking evidence that has been submitted to the Lab and for tracking samples that have been tested. It relies on a paper-based system for tracking the chain of custody. Crime Lab analysts use paper forms to record evidence sample identification information, as well as the results obtained by tests performed on each sample. The analytical files also are maintained entirely on paper.

The other significant technological impediment facing the Crime Lab is the use of HPD's archaic On-line Offense ("OLO") reporting system, which was first implemented as HPD's central investigative records system in the mid-1980s. OLO is poorly suited to be the reporting system for the Crime Lab. Among other things, OLO does not permit forensic scientists to enter important charts or tables -- particularly important in the area of DNA analysis -- into the entirely text-based system, which is a very significant limitation.

4. Relationships With Users of the Crime Lab's Services

The Crime Lab needs to build a reputation with investigators as a provider of reliable and valuable forensic services that can help them clear cases and identify perpetrators. To address this need, the Crime Lab has begun promoting its current forensic capabilities within HPD. However, certain types of analytical work performed by the Crime Lab -- including questioned documents examination and toolmark examination -- are vastly underutilized by HPD investigators.

5. Strategic Planning for the Crime Lab

For the past several years, the Crime Lab and HPD command staff responsible for support operations have been focused primarily on revising the Lab's SOPs, hiring qualified analysts, and preparing the Lab to obtain and maintain accreditation. Now that all of the current sections of the Crime Lab have received some form of accreditation and are able to issue reports, HPD command staff and Lab managers must turn their attention to developing a strategic plan for a full-service forensic science laboratory.

6. Key Lab-Wide Recommendations

a. Funding and Staffing

Funding levels for the Crime Lab must be maintained at least at current levels as adjusted for inflation and the addition of new personnel. The Crime Lab must fill currently vacant forensic science staff positions. As these positions are filled, the Crime Lab's overall budget must be adjusted proportionately upwards so that the equipment and other resources available to all of the analysts and sections in the Crime Lab are not adversely affected by the addition of new staff. Moreover, the Crime Lab must maintain at least its current ratio of funding per criminalist, adjusted annually for inflation and growth in the number of analysts in the Crime Lab, devoted to training and professional development activities.

b. Quality Assurance

The Needs Analysis Report prepared by the NFSTC for the Crime Lab in July 2003 recommended that HPD establish two positions dedicated to quality assurance. We support this recommendation. The current QA/QC Manager should be provided a qualified staff person, preferably with a background in or familiarity with the technical aspects of forensic serology and DNA analysis.

c. Information Systems

We are advised that HPD is in the process of retaining vendors to design a LIMS for the Crime Lab as well as a Department-wide RMS and that the City and HPD have hired consultants to assist HPD in defining the requirements of these systems and to help oversee their development. The new systems should include the following capabilities:

- The LIMS should apply to all sections and be integrated into the Department-wide RMS to provide a unified system for tracking the location and status of evidence on which forensic analysis may be performed.

- The LIMS should manage and track evidence items, as well as monitor work flow in each of the sections and Lab-wide.

- The LIMS should provide the Crime Lab with the ability to track cases based on the type of analysis performed on the evidence.

- The LIMS, in combination with the Lab's other information systems, should provide Crime Lab managers with reports and information necessary to evaluate the Lab's performance.

B. Current Work Performed in the Crime Lab

1. The Biology Section

The Crime Lab's Biology Section, which includes serology and DNA analysis, has undergone a substantial transformation over the four and a half years since the DNA Section was closed in December 2002. Among other things, the Biology Section is under new leadership, has substantially improved SOPs (based primarily on the SOPs used in the Texas Department of Public Safety ("DPS") crime laboratory system), and has trained a promising group of new DNA analysts. The Section resumed performing casework again last year after receiving provisional accreditation from ASCLD/LAB in June 2006, an important and necessary step for the Biology Section of the Crime Lab. In short, the current Section bears no resemblance to the entity that produced the shoddy, flawed, and unprofessional work during the period before its operations were closed in December 2002.

With that having been said, our overall assessment is that the current operations of the Biology Section reflect a mixed picture of substantial strengths and significant weaknesses when it comes to evidence examination, body fluid identification, and DNA typing. The Section performs very good work with respect to evidence documentation, the mechanics of DNA extraction, and DNA typing. However, there is significant room

for improvement with respect to certain aspects of the Section's approach to analyzing forensic cases, result interpretation, and report writing.

- **Forensic Evidence Recognition**. During our evaluation of the Biology Section's current casework, we reviewed three sexual assault cases in which DNA analysts performed DNA typing on evidence that the Crime Lab should have recognized would be unlikely to yield probative information about the assaults. Furthermore, the analysts overlooked other pieces of evidence in these cases which, if tested, might have generated valuable information.

- **Issues Associated With Semen Identification**. With the exception of lacking tests to characterize possible saliva stains, the Biology Section staff uses standard methodology to identify biological evidence such as blood or semen. Based on our review of the Crime Lab's current DNA cases, we developed some concerns that (1) in certain cases, Biology Section staff did not detect spermatozoa that may in fact have been present in semen stains and (2) in other cases, there may not have been a sufficient basis for an analyst's positive identification of semen.

- **DNA Results and Interpretation.** We found that the DNA analysts in the Biology Section produce usable and reliable typing results from forensic evidence, including items from difficult cases involving extractions from marginal samples such as hairs or a swab from a bite mark. However, we reviewed three cases in which DNA analysts had difficulty under the Biology Section's current SOPs in properly interpreting signals in the data.

- **Reporting Language**. We found that Biology Section's reporting often resulted in a presentation of the analysts' results that was convoluted, imprecise, and, in certain cases, inadvertently inaccurate. The awkwardly-stated conclusions appearing in many of the Crime Lab's DNA reports are difficult to understand.

In light of the above observations, we have the following key recommendations for the Biology Section:

- HPD should retain a qualified outside consultant to assist the Crime Lab in performing technical reviews of the DNA work performed by analysts in the Biology Section.

- The Biology Section case manager should focus on establishing the priority of cases and managing case assignments, tracking the status of each case submitted to the Biology Section, and reviewing all information, including submissions forms and investigative reports, related to cases submitted to the Crime Lab with

the assigned analysts in order to develop a forensic case strategy to ensure that all forensic evidence is obtained and fully exploited.

- The Biology Section's training program should include focused training in statistics, including the principles underlying random match probabilities, and in forensic serology techniques, such as screening for semen and identification of spermatozoa.

2. The Trace Evidence Section

The Crime Lab has gradually rebuilt its Trace Evidence Section operations. Two criminalists are now assigned to the Trace Evidence Section, one of whom has not yet completed training. In November 2006 the Crime Lab obtained provisional accreditation for trace evidence examinations from the Texas DPS. The one-year accreditation, granted in November 2006, permits the Section to move forward with efforts to obtain ASCLD/LAB accreditation. ASCLD/LAB inspectors audited the Crime Lab's current trace evidence operation in March 2007, and on June 11, 2007 the Crime Lab reported that accreditation was granted.

Because there currently is only one qualified trace evidence examiner in the Section, technical reviews of trace evidence casework are currently performed by an outside examiner. Crime Lab managers estimate that it will take between six months and a year for the second trace evidence examiner to complete the training necessary to qualify to perform casework. Once the second examiner is qualified, the two examiners will perform technical reviews of each other's cases. Although, upon completion of training and qualification, both examiners will have met the basic qualifications for such examinations as hair comparisons, they are both new and inexperienced examiners.

3. The Controlled Substances Section

Overall, we found that the Controlled Substances Section performs high quality work. The two most significant problems that we identified in the Controlled Substances Section's historical cases -- relating to the identification of pharmaceutical substances and the reporting of quantitative results for liquid and tablet substances -- have been addressed by the Section's current SOPs and the practice of the analysts reflects those changes.

Currently, there is only one supervisor in the Controlled Substances Section, who supervises both the Controlled Substances and Toxicology Sections. While there is a second supervisory position designated for the Controlled Substances Section, that position currently is vacant. The lone supervisor in the Controlled Substances Section is

spread too thin between his responsibilities for supervising all the analysts in the Section, reviewing technical issues related to the Section's casework, and performing his other administrative duties.

4. The Firearms Section

We found that the Firearms Section performs reliable and, in some cases, very high quality work. The most significant challenge facing the Section is its backlog of over 600 cases. The Firearms Section currently is staffed by four firearms examiners and one supervisor. There are currently two vacant firearms examiner positions. If these positions are not filled with experienced examiners, the training of the new examiners could take over a year. In the meantime, training the new hires will put further pressure on the Section. Professional development opportunities for the current Firearms Section staff are limited due to their workload constraints. The Section should be adequately staffed to permit its examiners to process cases in a timely manner, to regularly attend professional meetings, to give presentations, to contribute to articles to forensic science publications, and to carry out case-related research. Over the long run, these activities are crucial to the professionalism, reputation, and continued high quality work of the Firearms Section.

5. The Toxicology Section

In May 2005, ASCLD/LAB granted the Toxicology Section accreditation for blood alcohol testing.[15] In December 2005, the only analyst qualified to perform such testing was placed on administrative leave. We found no significant problems in the 2005 blood and urine alcohol files we reviewed, and we made a number of observations that reflected favorably on the work performed.

From December 2005 until March 2007, blood and urine alcohol testing was performed for HPD by several different outside laboratories, including the Harris County Medical Examiner's laboratory, the Texas DPS laboratory, and the Dallas County laboratory. The Toxicology Section now has an analyst who completed the necessary training in March 2007 and is qualified to perform blood alcohol testing. Analysts from the Toxicology Section continue to be responsible for calibrating and

---

15 The ASCLD/LAB accreditation states that the Crime Lab is accredited in Toxicology for "blood alcohol only." However, "blood alcohol" is a term that is used expansively in the forensic toxicology context to include alcohol testing in other body fluids as well. In many labs, urine alcohol results are converted to equivalent blood alcohol results and reported as a blood alcohol concentration.

maintaining breath alcohol testing equipment used for the approximately 4,000 breath alcohol tests administered each year by HPD officers.

6. The Questioned Documents Section

We are concerned about the underutilization of the Questioned Documents Section, which performs very good work. HPD has failed to take advantage of the high quality work performed by its questioned documents examiner. During 2005 and 2006, the Crime Lab's questioned documents examiner processed only 20 new cases -- 11 cases in 2005 and 9 in 2006. A police department in a city the size of Houston should be generating significantly more work for its document examiner.

VI. Findings and Recommendations Regarding The Property Room

The methods used for collecting, storing, and tracking evidence can have a significant impact on the Crime Lab's forensic work. In 2004, HPD disclosed that evidence from 8,000 criminal cases had been improperly stored and inventoried in the Property Room. As a result, evidence from at least 33 cases was inadvertently destroyed. Because of well-founded public concern regarding this disclosure, a review of the Property Room and CER was included in the scope of our investigation.

The more recent and profoundly troubling disclosure that 19 guns from the Property Room are missing, and that two additional firearms missing from the Property Room were found in the possession of suspects arrested by HPD, underscores the urgency of addressing issues relating to the Property Room. The conditions at the Property Room are a threat to the public safety and to the safety of Property Room employees, and they threaten to undermine the ability of Houston law enforcement agencies to perform their missions.

Many of the issues that we observed and have reported on in the past related to the storage and retrieval of evidence have been well known to HPD for at least ten years. In fact, a 1996 report prepared for then-Chief Nuchia made the unfortunately prophetic observation that weapons and other evidence in the Property Room were not secure, and that "publicity from the loss of evidence . . . would be very detrimental to the department."

News of the missing firearms may ultimately prove to have a positive effect if it creates sufficient momentum for the change that is necessary and long overdue. The commissioning of a comprehensive review of the Property Room was a very positive step toward improving Property Room operations. While our review was focused narrowly on issues that affect the Crime Lab, the review recently performed by Joseph Latta encompassed all aspects of the intake, disposition, and storage of evidence, and he

prepared a thoughtful, well-conceived, and clearly-presented report. In particular, we urge serious consideration of the observations and points made in the Latta Report, many of which mirror the observations we have made during the course of our review of HPD's practices and procedures related to the collection and storage of evidence.

1. Findings Regarding Evidence Storage and Retrieval

a. Evidence Storage

Storage of biological evidence has been an ongoing problem for the Property Room. The primary issue is the lack of sufficient temperature-controlled space for storing such materials. Before 1998, the Property Room stored sexual assault kits and other body fluid evidence in a freezer for a period of 18 months. After 18 months, the evidence was moved to air-conditioned areas in the Property Room for long-term storage. By 1998, the Property Room was running out of space in the freezers as well as in the air-conditioned storage area. In April 1998, in reliance on the information received from the Crime Lab, Property Room personnel began relocating sexual assault kits and other biological evidence to general property storage areas. The general property storage areas are not air-conditioned and, therefore, are subject to high humidity and temperatures. Although it is not necessary to freeze biological evidence (for example, bloodstained fabric), such evidence is much more likely to degrade in a high humidity, high temperature environment. This practice, therefore, raises serious concerns about HPD's current practices for storing biological evidence.[16] Additionally, Crime Scene Unit personnel report that instructions received from the Crime Lab and the Property Room regarding the freezing or refrigeration of biological evidence have caused some confusion, so these policies should be more clearly communicated.

Storage of controlled substances evidence by the Crime Lab's CER also presents challenges. Drug evidence that fits into evidence envelopes is stored in CER based on the order of its laboratory number. Larger items are stored in other sections of the CER vault on a space-available basis. Locating some of these larger items is frequently difficult and depends largely on the institutional memory of the searcher. High turnover rates among CER clerks, attributed mostly to low salaries, contribute to the difficulty of retrieving this type of evidence. Because controlled substance evidence is stored in CER for extended periods awaiting destruction orders, the CER is left with severely limited storage space.

---

16 For example, in May 2004, water caused damage to 10 to 12 boxes of evidence due to a roof leak. Nine of these boxes contained clothing with possible biological evidence. The wet clothing was removed and hung to dry before being checked back into the Property Room.

Evidence, including weapons, from approximately 3,000 firearms cases is stored in the Crime Lab firearms vault rather than in the Property Room. Some of the evidence in the firearms vault dates back to 1998 cases. Because of staffing shortages, it is necessary for a firearms examiner to transfer evidence from the Firearms Section of the Crime Lab to the Property Room. Due to the caseload in the Firearms Section, removal of evidence from the vault is not a priority; it has been approximately two years since examined firearms evidence was transferred to the Property Room. Moreover, the contents of the firearms vault have never been inventoried.

b. Evidence Tracking and Chain of Custody

Evidence collected by HPD personnel can be found in the Property Room, the Crime Lab, the District Attorney's Office, the Harris County District Court clerk's office, or the Sheriff's property room. Investigators reported to us that locating evidence is a major problem because of poor tracking systems. HPD's central OLO investigative reporting system does not contain an evidence tracking program, and there is no interoperability between OLO and a bar-coded evidence tracking system that was adopted by the Property Room.

The Property Room first began using a computerized evidence tracking system and bar-coded evidence tags in the late 1980s or early 1990s. This system is obsolete and requires a significant amount of paperwork. One bar code is attached to the HPD's Property and Evidence form, and a different bar code is attached to the corresponding evidence. Therefore, the bar-coded number on the paperwork is not the same as the bar-coded number on the associated item of evidence. Moreover, the bar-coding system currently used by the Property Room uses an alpha-numeric system that does not permit a simple and reliable process for storing evidence.[17]

The Property Room also uses a number of cumbersome and archaic forms to track chain of custody. These forms increase the chance of errors and the risk of misplaced evidence. When evidence is transferred to an analyst, the chain of custody form travels with it, and no record of the transfer is retained by the Property Room.

c. Evidence Retrieval

Crime Lab personnel have reported delays in the retrieval of various pieces of evidence from the Property Room. Managers and investigators also report difficulty

---

[17] For example, a Property Room Form could be given a bar code with the alpha-numeric code G3P7, while the bar code placed on the corresponding piece of evidence would have an alpha-numeric code such as G3P9.

locating specific evidence for examination or trial or in response to defense motions to produce evidence. We have been told that, in some cases, efforts to retrieve evidence are futile.

Paper bags, boxes, and a variety of other containers are used to store most pieces of evidence, which, among other things, makes retrieval more difficult because the evidence is difficult to see without breaking the seal and removing the evidence from the container. Removing the evidence creates unnecessary risks that can be avoided by submitting evidence in transparent plastic evidence bags. For example, evidence can be lost or stolen, create a hazard, or become contaminated when removed from its container. Many law enforcement agencies use breathable clear plastic bags or envelopes to improve the ability to observe and retrieve evidence.

We found that storage and retrieval of controlled substances evidence for Crime Lab analysis is extremely difficult because of understaffing and inadequate storage and workspace. Large evidence seizures and evidence awaiting destruction or filing are stored in the aisles and work areas in the CER complex. The clutter and crowding of the workspace make retrieval and filing of evidence more difficult.

2. Key Recommendations

- HPD should develop standard evidence procedures specifically for all types of forensic evidence and require that evidence be submitted to one central location, rather than to the several units that are currently used (including the Property Room, CER, the Firearms Section, and the Questioned Documents Section).

- A new evidence tracking system should be implemented that includes complete seamless integration with all of the existing evidence tracking systems. Software vendor(s) and HPD management should be held accountable for the creation and implementation of a new evidence tracking system that integrates all evidence in the Property Room and CER into a user-friendly, numerically sequential program.

VII. Conclusion

More than four years ago, HPD was shaken by a series of devastating disclosures focusing primarily, but not exclusively, on the Crime Lab's DNA work. After re-testing by outside laboratories confirmed in March 2003 that DNA analysis performed by the Crime Lab played a central role in the wrongful conviction of Josiah Sutton, the potential implications of the Crime Lab's problems became real. The people of Houston and many of the city's public officials quite appropriately questioned how many

wrongful convictions may have been obtained based on flawed forensic evidence and its presentation to Harris County juries. The City and HPD commissioned this independent investigation, in part, to answer the profound and important questions about the depth and breadth of the problems infecting the Crime Lab and to identify the scientific and management failures that contributed to the state in which the Lab found itself by late 2002.

This report reflects an exhaustive effort to examine the full range of issues implicated by the Crime Lab's profound problems that began to be exposed in late 2002 and early 2003. We found that the Crime Lab was starved for resources for the better part of two decades, starting no later than the early 1980s. HPD criminalists were underpaid, poorly trained, and worked in conditions that included, among other things, a leaky roof that HPD did not repair for years, thus allowing rainwater to pour into the Crime Lab. The DNA Section lacked competent supervision and technical guidance, and analysts who had worked in the Section for years were seemingly oblivious to how far their analytical procedures and reporting conventions departed from generally accepted forensic science principles. Under these circumstances, the risk that casework performed by the Crime Lab, particularly by the DNA Section, would lead to miscarriages of justice was unacceptably high. We have described the far-reaching consequences of such failures in the deeply flawed work performed in serology and DNA and the fact that questions generated by that flawed work continue to exist in scores of cases years, and in some cases decades, after the work was performed.

If the initial response was halting and uncertain, the City and HPD have in the last three years demonstrated a commitment to uncovering the full extent of the Crime Lab's historical problems and to taking the necessary remedial steps to make the improvements that the Lab so desperately needed. Over the past several years, the City and HPD have invested heavily -- in resources and attention -- in salvaging and rebuilding the Crime Lab. Funding for the Crime Lab has more than doubled; HPD has significantly increased analysts' salaries, thus significantly improving the Lab's ability to recruit and retain analysts; the Lab has recruited new managers who are competent and take their responsibilities as supervisors and managers seriously; analysts undergo rigorous formal internal training and attend outside training programs; and the Lab has implemented a credible quality assurance program. Finally, the Crime Lab has been accredited by ASCLD/LAB, an accomplishment that would have been unthinkable and unattainable for the old Lab.

Under its current leadership, the Crime Lab has steadily moved in the right direction over the past three and a half years. Our review of its current operations clearly demonstrates that the Crime Lab now bears little resemblance to the substantially dysfunctional institution that reached its nadir in the late 1990s and early 2000s. Our detailed recommendations are intended to help the Crime Lab improve

further. As reflected by our observations and recommendations, there are challenges ahead for the Crime Lab and, in some areas, room for continued improvement. We offer these recommendations in the hope that they will be followed and that they will have a lasting and positive effect on the quality of the forensic science practiced at HPD.

Our most significant concern is that the increased funding and attention that has been central to the Crime Lab's recovery so far may be transitory. After the current spotlight on the Lab's push toward accreditation and on the results of this investigation fades in the near future, the City and HPD must sustain the effort and monitoring that are necessary to ensure that the Crime Lab remains able to perform consistently competent and reliable forensic analysis. HPD and the City have seen all too clearly the dire consequences for the accuracy, integrity, fairness, and reputation of the criminal justice system when flawed scientific evidence is produced in the Crime Lab, as was the case in the Serology and DNA Sections for many years. Having seen the costs -- in money, turmoil, and injustice -- that a flawed Crime Lab can produce, HPD and the City must make sure that the needs of the Crime Lab are never again ignored.

TABLE OF CONTENTS

Page

Page

Page

Page

Page

Page

Page

Page

Page

Page

Page

Page

Page

Page

Introduction

This is the Final Report of the Independent Investigator for the Houston Police Department ("HPD") Crime Laboratory and Property Room. This report includes the final findings and recommendations of the independent investigation that began in April 2005. Accordingly, this report incorporates information that was discussed in our previous five reports, as well as a substantial amount of new material that has not previously been published.[1]

The City of Houston (the "City") and HPD commissioned this investigation following a two-year wave of adverse publicity that began in November 2002 and raised serious questions about the quality of the forensic science work in the Crime Lab. The City and HPD should be commended for authorizing an independent and public assessment of the extremely serious historical problems that have generated so much adverse publicity for the Crime Lab and for HPD and have created profound doubts about the integrity of important aspects of the criminal justice system in Harris County. It should serve as a model as to how to responsibly address failures of critical institutions in the criminal justice system.

The goals of the investigation and of this final report are to (1) provide a thorough and detailed account of the management and operational issues that contributed to the crisis that HPD and the Crime Lab experienced; (2) identify potential cases of injustice resulting from flawed or misleading forensic science work; (3) thoroughly examine and assess the scientific and administrative problems related to the Lab's work across all of its sections, focusing primarily on cases worked during the 1998-2004 period but extending more broadly with respect to certain forensic disciplines, especially serology; (4) provide a comprehensive assessment of the current operations of the Lab and Property Room; and (5) formulate recommendations designed to ensure that the Lab and Property Room meet the public's legitimate expectations that the Lab and Property Room contribute to the maximum extent possible to the fair administration of criminal justice in Harris County.

The independent investigation, which began in April 2005, originally was divided into two phases. During Phase I, which we completed with the issuance of our Third Report on June 30, 2005, we investigated the historical operations, practices, and management of the Crime Lab and Property Room and formulated the scope of the work to be performed during the second phase of the investigation. Phase II, which

---

[1] All six of the reports of the independent investigation are posted on our Web site at www.hpdlabinvestigation.org.

began with the Houston City Council's approval of our Phase II Plan on August 24, 2005, involved evaluating the technical work performed in the Crime Lab through the end of 2004. Specifically, Phase II involved the review of hundreds of cases originally analyzed by the Crime Lab in the seven forensic science disciplines historically practiced in the Lab -- serology, DNA, controlled substances, firearms, trace evidence, toxicology, and questioned documents.

During the course of the investigation, the scope of our review of the Crime Lab's historical serology cases expanded significantly. As reflected in our Phase II Plan, we originally anticipated reviewing a sample of approximately 336 serology cases processed by the Crime Lab during the 1987-1990 period. However, we quickly uncovered widespread and serious problems with the forensic serology work performed by the Crime Lab during that period. Those problems included the failure of Crime Lab serologists to use and document appropriate testing controls; the widespread technical and interpretive errors across dozens of cases; the failure to report potentially probative typing results; and at least one case -- involving the currently incarcerated defendant Dwight H. Riser -- in which the long-time head of the Lab's historical Serology Section (and later, its DNA Section), James R. Bolding, appears to have committed scientific fraud and perjury. In light of these findings, the Stakeholders Committee that oversees this investigation and HPD approved our recommendation to expand the review of the Crime Lab's serology cases to include all cases related to currently incarcerated prisoners that were analyzed by the Lab since 1980, the year Mr. Bolding began performing serology work in the Lab.

To HPD's credit, the Crime Lab has not remained static during our investigation. Between the start of the independent investigation in April 2005 and the completion by May 2006 of the bulk of our historical reviews, the Lab underwent significant changes and made significant progress in shedding its troubled past and building on changes that had begun as early as 2003. Under the new leadership of the current head of the Crime Lab, Irma Rios, the Lab has revised the standard operating procedures ("SOPs") for each of its sections, implemented a new quality assurance and quality control ("QA/OC") program, developed new training programs for analysts, and hired a number of new supervisors and analysts, including a qualified DNA technical leader. On May 10, 2005, the American Society of Crime Laboratory Directors/Laboratory Accreditation Board ("ASCLD/LAB") accredited the Crime Lab, for the first time, in the disciplines of controlled substances, blood alcohol analysis, questioned documents, firearms, and serology.[2] In June 2006, after substantial preparation that included the

---

[2] Accreditation through ASCLD/LAB is a voluntary program in which a "crime laboratory may participate to demonstrate that its management, personnel, operational and technical procedures,

Footnote continued

recruiting and training a new class of DNA analysts, ASCLD/LAB granted the Crime Lab provisional accreditation for DNA analysis, which allowed the Lab to resume forensic DNA profiling work. The Crime Lab underwent another ASCLD/LAB accreditation inspection in March 2007, which included a review of the status of the Lab's DNA operation, as well as ASCLD/LAB's first inspection of the Lab's trace evidence examination work. On June 11, 2007, the Crime Lab reported that it had received notification from ASCLD/LAB that accreditation had been granted to the Crime Lab's operational units.

In light of the significant changes implemented by HPD and the Crime Lab during the 2003-2005 period, our investigation also broadened to include a review of the Crime Lab's current operations. In order to furnish the City and HPD with relevant and specific recommendations designed to enable the Crime Lab and Property Room to provide the people of Houston with first-rate forensic science services, we reviewed cases processed by the each of the Lab's sections since accreditation was obtained in May 2005, as well as policies and practices related to the current management and administration of the Lab and Property Room.

Our two-year investigation of the Crime Lab covered a period of more than 25 years, included more than 100 interviews, and involved the review of more than 3,500 forensic science cases analyzed by the Lab. During the course of our investigation, we developed an enormous body of information about the collection, storage, analysis, and use of forensic evidence in the Harris County criminal justice system. The findings and recommendations contained in this report are designed to fairly and objectively assess the past, evaluate the present, and recommend reforms that will assist the City and HPD in providing the best possible forensic science services to the people of Houston and Harris County.

Footnote continued from previous page

equipment and physical facilities meet established standards." www.ascld-lab.org/dual/aslabdualaboutascldlab.html.

The Independent Investigation

The events that eventually led to the hiring of an independent investigator to review the Crime Lab's historical and current operations began on November 11, 2002, with the first in a series of investigative news reports that aired on KHOU-Channel 11, a local Houston television station. These television news reports, the product of an extended investigation performed by KHOU in consultation with outside forensics scientists, severely criticized the forensic analysis performed by the DNA/Serology Section of the Crime Lab in a number of specific cases.

Within a month of the airing of the first of these news reports, Acting Chief of Police Timothy Oettmeier commissioned an outside review of the Crime Lab's DNA/Serology Section. Representatives from the Texas Department of Public Safety ("DPS") Crime Lab Headquarters and the Tarrant County Medical Examiner's ("ME's") Office performed an audit of the Crime Lab's DNA/Serology Section over the course of two days, on December 12 and 13, 2002. On December 18, 2002, based on the preliminary oral report of the auditors, HPD suspended all DNA analysis in the Crime Lab. The final report reflecting the audit's findings was issued on January 10, 2003. DNA work by the Crime Lab remained suspended until June 2006, when the Crime Lab received provisional ADSCLD/LAB accreditation necessary to permit it to resume DNA analysis.

In early 2003, HPD, in close consultation with the Harris County District Attorney's Office (the "District Attorney's Office"), began identifying all cases in which some form of DNA analysis had been performed by the Crime Lab. This process evolved into a long-term re-testing project coordinated among HPD, the District Attorney's Office, and outside DNA laboratories. This re-testing project identified a total of 415 criminal cases involving DNA analysis performed by the Crime Lab. More than four years later, the post-conviction DNA re-testing program has failed to resolve 55 of these 415 cases.

On or about February 21, 2003, Donald Krueger retired after serving as head of the Crime Lab for approximately eight years. Following Mr. Krueger's retirement, Robert Bobzean, a senior manager in the Crime Lab, took over leadership of the Lab on an interim basis. In mid-July 2003, Frank Fitzpatrick of the Orange County (California) Sheriff-Coroner 's Office was appointed Interim Director of the Crime Lab as part of a contract entered into by the City and the National Forensic Science Technology Center ("NFSTC"). During the course of its work, NFSTC produced written evaluations of various aspects of the Crime Lab's operations. In October 2003, questions arose regarding the quality of work performed by the Crime Lab's lead toxicologist, Pauline Louie, which led to the suspension of toxicological analysis by the Lab. Also, in October

2003, Irma Rios was appointed to be the new head of the Crime Lab. Ms. Rios had been with the DPS crime laboratory system for over nineteen years and was a member of the outside audit team that reviewed the Crime Lab's DNA/Serology Section in December 2002.

On or about September 1, 2004, HPD Chief of Police Harold L. Hurtt announced that HPD would seek an independent review of the Crime Lab. Chief Hurtt formed a Stakeholders Committee -- composed of Houston-area public officials, civil rights advocates, academics, attorneys, and scientists -- to oversee the selection and progress of the independent investigator. In November 2004, the Stakeholders Committee met for the first time, and, on December 2, 2004, the City issued a Request for Proposals ("RFP") to conduct an independent review of the Crime Lab and Property Room. On February 2, 2005, the Stakeholders Committee announced its selection of our team of lawyers and forensic scientists to perform a comprehensive, independent investigation of HPD's Crime Lab and Property Room.

On March 30, 2005, the Houston City Council approved the contract authorizing us to conduct this investigation, and we began our work immediately thereafter.

We are satisfied with the level of cooperation we received from HPD and the Crime Lab and Property Room. Based on what we have seen over the past two years, the City and HPD are committed to improving the analysis and use of forensic evidence in connection with law enforcement in Houston. The investigation was necessarily a lengthy and difficult process that examined sensitive issues related to the Crime Lab's management, operations, and technical work both historically and currently. The burdens of cooperating with this investigation were substantial, coming at the same time as HPD was undertaking significant reforms of the Crime Lab and continuing to meet operational demands. Ultimately, under Chief Hurtt's leadership, HPD and the Crime Lab fulfilled our requests for documents and other materials as well as for access to personnel, thus enabling us to perform a thorough and comprehensive investigation of both the historical and current practice of forensic evidence analysis at HPD. HPD should be commended for its support of and cooperation with the investigation.

As it took shape, our investigation had three main elements:

- **Historical operations of the Crime Lab and Property Room**. We gathered and analyzed facts regarding the historical management, administration, and operations of the Crime Lab and Property Room; this analysis included a review of more than 3,500 cases analyzed by each of the sections of the Lab. The central task was to assess the Lab's technical work prior to accreditation.

- **Serology incarceration cases**. We identified and reviewed all of the historical serology cases related to still-incarcerated defendants that were processed by the Crime Lab between 1980 and 1992, a total of 850 cases.

- **Review of the current operations of the Crime Lab and Property Room and formulation of recommendations for improvement**. We analyzed the current operations of the Crime Lab and Property Room, in part through the review of a statistical sampling of cases analyzed by each section of the current Crime Lab after accreditation. Based on that review, we developed recommendations regarding the collection, storage, analysis, and use of forensic evidence.

I. Review of Historical Operations

Our investigation of the management, operations, and performance of the Crime Lab and Property Room relied on information gathered from a range of sources, including: (1) interviews of people familiar with the operations of the Lab, including current employees, former employees, and others who dealt with the Lab in various capacities; (2) the review of a large volume of documents obtained from HPD and other sources concerning the policies, practices, and resources of the Crime Lab and Property Room; and (3) the detailed review by our team of forensic scientists of hundreds of cases analyzed by the Lab. Based on these sources of information, we have developed an understanding of the culture and practices of the Crime Lab as a division within the hierarchy of a law enforcement agency, as the work environment of its management and staff, and as a scientific laboratory.

A. Documents and Interviews

On April 4, 2005, at the very outset of our work, we submitted a letter to HPD requesting a broad range of documents calling for all responsive information, in whatever form, including but not limited to correspondence, memoranda, reports, journals, manuals, hard copy paper files, e-mail, computer files, electronic databases, and videotapes. On April 4, 2005, we also provided HPD with a letter requesting that it take steps to ensure that all materials potentially relevant to our investigation be preserved.

A partial list of the materials we have reviewed during the investigation includes: correspondence files maintained by the office of the Chief of Police; files maintained by the Crime Lab, including correspondence files;[3] a small volume of e-mail

---

[3] The Crime Lab has retained correspondence files going back only to 1998. Crime Lab correspondence files for the years 1997 and prior were discarded pursuant to routine practices of

Footnote continued

and other electronic documents from the hard drives of current and some former Lab employees; personnel files; files kept by individual current and former Lab analysts and supervisors; lab journals; laboratory case files; Lab manuals, policies, SOPs, and training materials; investigative files maintained by HPD's Internal Affairs Division ("IAD"); documents obtained, with the Lab's authorization, from ASCLD/LAB that relate to the accreditation process; reports prepared by outside consultants regarding the Crime Lab and Property Room; budgetary and grant-related documents; and HPD policies, procedures, and inspection reports related to the Property Room.

We conducted more than 100 interviews of people familiar with the collection, analysis, and use of forensic evidence in Harris County, including all current Crime Lab personnel, as well as many former members of the Lab staff, HPD officers and investigators, representatives from the District Attorney's Office, Property Room personnel, and the former interim director of the Lab. We interviewed all of the members of HPD's staff in the chain of command over the Crime Lab during the 1997-2003 period, including former Chief of Police C.O. Bradford, Executive Assistant Chief of Police Timothy Oettmeier, former Executive Assistant Chief Dennis Storemski, and former Assistant Chief of Police Milton Simmons, whose recollections and perspectives were central to our efforts to develop a complete and balanced picture of the challenges and problems that confronted the Lab over time and the reasons for its documented failures.

In addition to law enforcement personnel, we met with representatives of the Houston criminal defense bar to get their perspective on issues related to the criminal justice system in Harris County generally, and in the Crime Lab in particular. We also had extensive discussions with two critics of the Crime Lab who had prominent roles in bringing the problems in the DNA/Serology Section to light, Professor William Thompson and Dr. Elizabeth Johnson.

Our efforts to obtain the cooperation of three key former Crime Lab managers and analysts -- Donald Krueger, James Bolding, and Christy Kim -- produced mixed results. During the first phase of the investigation, we conducted several telephonic interviews with Mr. Krueger, who joined the Crime Lab as an analyst in 1978 and was its director from 1995 until early 2003. Mr. Krueger initially refused to meet with us in

---

Footnote continued from previous page

the Crime Lab Division prior to the sustained adverse publicity surrounding the Lab that began in November 2002. At that time, documents were ordered preserved. We have found no evidence that any documents were destroyed after that time. We have interviewed personnel responsible for the document destruction in earlier years and have concluded that it was performed consistent with long-existing document retention practices within the Crime Lab.

person, which prevented us from asking him questions about certain important documents. Mr. Bolding, a former serologist as well as the head of the Crime Lab's historical serology and DNA operations, met with us in person twice during the early stages of the investigation. Ms. Kim, a prolific serologist and DNA analyst who personally analyzed many of the troubling biological cases that we identified from the 1980s through the early 2000s, never agreed to speak with us.

As our investigation and case reviews progressed and as we began to discover very troubling issues with the Crime Lab's analytical work and reporting in the areas of serology and DNA, we made additional attempts to enlist the cooperation of Mr. Krueger, Mr. Bolding, and Ms. Kim. In late 2005 and early 2006, we requested detailed interviews with each of these central figures in the Crime Lab's history. All three either declined to meet with us or failed to respond to our requests. In response, we explored various avenues to compel the cooperation of these individuals, none of which proved workable.[4] Mr. Krueger eventually agreed to meet with us in person even in the absence of a subpoena, and we took his testimony in June 2006.[5] Mr. Bolding and Ms. Kim, however, refused our renewed requests for detailed examinations that would have included specific questions about the analytical procedures applied and interpretations made in specific cases, as well as about the administration of the Crime Lab from the 1980s through the early 2000s.[6]

B. Review of the Crime Lab's Historical Cases

During the first three months of the investigation, we reviewed the historical operations and practices of the Crime Lab and Property Room. Among other things,

---

4 The General Investigating and Ethics Committee of the Texas House of Representatives offered to assist the investigation through the exercise of the Committee's subpoena authority. Unfortunately, the rules of the Committee would not allow for the examination of these witnesses under the conditions that we believed were necessary to advance the objectives of the investigation. Nevertheless, we greatly appreciate the Committee's efforts and its support of this investigation.

5 Mr. Krueger was apologetic for failing to respond to our earlier requests for an in-person interview, claiming that he had failed to receive our multiple requests.

6 Mr. Bolding's attorney told us that he had advised Mr. Bolding not to cooperate further with our investigation because, "based largely on assertions made in [our] reports," Mr. Bolding had been sued. The attorney was referring to the lawsuit brought by George Rodriguez in August 2006 against the City, Harris County, and various individuals, including Mr. Bolding and Ms. Kim, relating to Mr. Rodriguez's conviction of aggravated assault and aggravated kidnapping in 1987, for which Mr. Rodriguez spent more than 17 years in prison before his release in 2004. The Crime Lab's work in Mr. Rodriguez's case is the subject of a detailed discussion later in this report.

this first phase of the investigation was designed to lead to the development, in consultation with HPD, of a detailed plan for Phase II of the investigation, which centered on the review of cases analyzed by the Crime Lab prior to ASCLD/LAB accreditation. We provided our Phase II Plan to HPD on July 6, 2005.[7]

1. Sampling Methodology

The second phase of our investigation involved reviewing large numbers of cases -- selected to be statistically valid samples -- analyzed by the Crime Lab during defined time periods. The samples were drawn from the seven forensic science disciplines applied in the Crime Lab -- serology, DNA, controlled substances, toxicology, trace evidence, questioned documents, and firearms. These cases were reviewed by our team of forensic scientists and evaluated with reference to the Crime Lab's SOPs in place at the time, as well as to applicable principles and practices generally accepted within the forensic science community during the time the Lab conducted its analysis of the cases.

During Phase I of the investigation, we reviewed the methodology by which HPD arrived at its sample size of 1,966 cases included in the RFP. We determined that it would be prudent to consult with expert statisticians to develop our sample populations. After advising HPD and gaining the approval of the Stakeholders Committee, we retained and consulted with statisticians from PricewaterhouseCoopers LLP ("PwC"), including PwC partners Dr. Jessica Pollner and Arthur Baines. With PwC's guidance, we developed appropriate sample sizes for the historical case reviews to be performed by our forensic scientists in each of the following forensic science disciplines:

- Serology (1980 - 1992)
- DNA (1992 – 2002)
- Trace evidence (1998 – 2004)
- Controlled substances (1998 – 2004)
- Firearms (1998 – 2004)
- Toxicology (1998 – 2004)

For the last discipline, questioned documents, because of the relatively small number of cases examined, we decided to review all of HPD's questioned documents cases examined between 1998 and 2004. We also selected separate statistically-based sample populations of the controlled substances cases analyzed by former HPD

---

7 The Phase II Plan is posted on our Web site.

Criminalists Vipul Patel and James Price, both of whom, as discussed later in this report, were involved in instances of drylabbing in the Controlled Substances Section.[8]

In December 2005, in light of the pervasive and serious problems in the serology and DNA cases we reviewed the previous fall, we recommended to the Stakeholders Committee and to HPD that we modify the scope and focus of our case reviews in both of these areas.

With respect to serology, we suggested that (1) the relevant time period for the reviews be extended earlier in time to January 1980, prior to when Mr. Bolding began analyzing biological evidence in the Crime Lab, and (2) the statistical sampling be abandoned in favor of reviewing every serology case related to still-incarcerated prisoners, whether convicted either by guilty plea or trial verdict, from 1980 through the early 1990s when traditional ABO typing was supplanted by DNA analysis.

With respect to DNA, we also recommended against completing the review of all the cases in the statistical sample as originally drawn in favor of focusing on the cases identified by HPD and the District Attorney's Office for re-testing that either (1) had not yet been re-tested by an outside laboratory or (2) had been re-tested and the Crime Lab's original DNA findings could not be confirmed. As we discussed above, the post-conviction DNA re-testing program was designed to identify all cases in which DNA analysis was performed and a conviction resulted, either by guilty plea or after trial.

These recommended changes in the scope of the investigation reflect that our initial serology and DNA case reviews revealed so many major issues and problems that it made sense to focus on identifying cases that may have resulted in miscarriages of justice rather than to continue using a random sampling technique, which almost surely would have continued to show an unacceptably high rate of analytical errors. The Stakeholders Committee and HPD approved both of these recommendations, and we adjusted our selection of serology and DNA cases for review accordingly.

We completed all of the historical case reviews in the nine categories of cases. The following chart summarizes the number of historical cases we reviewed during Phase II of the investigation.

---

8 "Drylabbing" is a colloquial term for a form of egregious scientific fraud involving the fabrication and reporting of scientific results for tests that actually never were conducted.

Category of Cases	Number of Historical Cases Reviewed
DNA[9]	135
Serology[10]	1,020
Controlled Substances[11]	563
James Price	342
Vipul Patel	366
Toxicology	396
Trace Evidence[12]	263
Firearms[13]	330
Questioned Documents[14]	91
Total Cases	3,506

---

9 The DNA case reviews include all 18 death penalty cases involving DNA testing by the Crime Lab.

10 As discussed in detail in the serology section of this report, the total number of serology cases we reviewed includes cases from our original serology sample, serology conviction cases, serology incarceration cases, and all serology death penalty cases since 1980, including cases where the defendant has been executed.

11 This figure includes 150 cases from our original controlled substances sample and 363 cases from a reconfigured sample that we prepared, in consultation with PwC, to target substances analyzed in the Crime Lab other than marijuana and cocaine. In addition to the samples, we also reviewed 50 "bulk" controlled substances cases in order to evaluate how the Crime Lab and Property Room handle bulk seizures of controlled substances.

12 Our sample included 223 trace evidence cases. In addition to those cases, we reviewed the trace evidence component of 40 cases identified as serology or DNA cases.

13 Our original sample of historical firearms cases totaled 364 cases. We found that evidence in 34 of these cases, the review of which would be necessary to evaluate the conclusions reported by the Crime Lab, was not in HPD's possession because it either had been destroyed (6 cases) or was in the custody of other entities, such as the courts (28 cases). PwC advised us that -- in light of the conservative parameters used in establishing our sample sizes and the lack of major issues identified by our review of the other 330 cases comprising our firearms sample -- these 34 cases could be excluded from the sample frame without affecting the reliability of our representative sample of the Crime Lab's historical firearms cases.

14 In our Phase II Plan, we estimated that the total number of Questioned Documents Section cases that we would review was approximately 200. This estimate was based on the total number of cases identified on the Questioned Documents Section case log. Once we began our case review, it became clear that only 91 of the cases on the Questioned Documents Section case log involved substantive work that we could review. The remaining cases did not involve technical work by the questioned documents examiner.

2. The Case Review Process

We employed a consistent process for reviewing Crime Lab cases throughout the investigation. We performed the vast majority of our case reviews on site at HPD headquarters, where the Crime Lab is located. We had access to Crime Lab staff, documents, and raw data, including autoradiographs and photographs of DNA test strips. When necessary, we reviewed available underlying evidence to assess the reasonableness of the Crime Lab's original forensic science work.[15]

We designed our case reviews to determine whether the cases in our samples were processed and analyzed in a manner consistent with the SOPs existing in the Crime Lab at the time the analysis was performed and consistent with the generally accepted forensic science principles prevailing at that time. The case reviews were not designed to evaluate the work of Crime Lab analysts against a standard of perfection, nor to use the forensic sciences standards prevailing after 2004 to evaluate work done, in some cases, many years earlier.

We devoted substantial effort to ensure that the case review process was managed effectively and efficiently and that the case reviews were conducted consistently regardless of which individual expert on our investigative team performed the review. We sought to be thorough, fair, objective, and consistent. To attain these goals, all members of the team applied the same written standards for evaluating case files. These standards were established in consultation with our Scientific Advisory Board and applied to each forensic science discipline under review.

In order to advance the goals of clarity, consistency, and coherence in our case reviews, we attempted to draw appropriate distinctions among the various deficiencies we identified during the reviews. Our main tool for doing so was to distinguish "major issues" from "minor issues," categories which we defined at the outset of the case review process in consultation with our team of forensic scientists. As described below, we used a careful and rigorous quality assurance process, which included second reviews by the most experienced forensic scientists on our team of all cases identified as containing a major issue. Even so, it is important to note that the process of categorizing deficiencies identified in the Crime Lab's historical cases involved a certain amount of judgment and discretion.

---

15 Consistent with the scope of our mandate, we have not re-tested any evidence. We reviewed underlying evidence only in cases where information and documentation in the Crime Lab file -- such as photographs, narrative descriptions of the evidence and the analyses conducted, and laboratory notes -- were inadequate to permit us to assess the reasonableness of the original forensic science work.

a. Major Issues

Major issues are matters that raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analyst's reported conclusions. We characterized an issue as major if, for example, it involved:

- significant errors in the testing, evaluation, or handling of evidence or in the reporting of results;
- serious omissions, including when an analyst failed to perform a critical examination or analysis; or
- analytical work that was undocumented or insufficiently documented to permit an outside reviewer to assess the basis of the analyst's conclusions.

Examples of major issues include failure to report probative findings, incorrectly reporting probative findings, reporting incorrect conclusions, reporting findings that are unsupported by documented testing, and failing to perform a critical examination or analysis.

b. Minor Issues

Minor issues are matters that involve deviations from generally accepted forensic science principles or from the Crime Lab's SOPs. However, minor issues are different from major issues in that they do not appear to raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analyst's conclusions. Minor issues may include, for example:

- failure to provide sufficient or accurate documentation, but where the basis for the analyst's conclusions can nevertheless be determined and reviewed; or
- deficiency in the management of the case that includes, but is not limited to:
    - failure to perform the analysis within a reasonable period of time,
    - failure to provide adequate supervisory oversight and review, or
    - failure to reasonably organize the case file and case notes.

The distinctions between major and minor issues sometimes can be subtle and frequently are case-specific. In some cases, we concluded that a case involved only minor issues, even though we identified significant deficiencies in the analyst's work. We reached this conclusion when we found that the deficiencies ultimately did not

cause us to have significant doubt about the reliability of the work performed or the correctness of the analyst's results or that the deficiencies would not have had a material impact on the results of the forensic science work in the case.

c. Quality Assurance Review

Members of our Scientific Advisory Board conducted quality assurance ("QA") reviews of the case evaluations performed by each of the forensic scientists on our team. The members of the Board reviewed every case that was preliminarily identified as having one or more major issues. The experts and QA reviewers conferred about every case raising a potential major issue and reached agreement before any final determinations were made on how to categorize an issue. The QA reviewers also evaluated randomly selected files from the case sample to confirm that cases were being assessed consistently and in accordance with our review standards.

C. Serology Incarceration Case Reviews

We drew our original sample of serology cases from cases assigned to analysts working in the Serology Section of the Crime Lab from 1987 through 1990.[16] Based on our initial serology case reviews, we found that the Crime Lab continued to perform ABO typing through 1992, even after the Lab had established its DNA analysis capability. We also found that our original sample of serology cases, which was derived from the Crime Lab's ledger of cases assigned to analysts in the DNA/Serology Section during the relevant time period, included a large proportion of cases that did not involve any substantive forensic science work by the Lab and, therefore, would not provide a basis to assess the quality of the Lab's serology work. For example, we found that, upon receiving a sexual assault kit, the Crime Lab typically would assign a Lab number and generate a Lab file. However, if no suspect was identified or no samples were provided for comparison with the evidence in the sexual assault kit, the Crime Lab usually would only inventory the contents of the sexual assault kit and would not analyze the evidence.[17]

---

16 HPD defined 1987 as the original starting date for the period from which we would select serology cases for review because the Crime Lab performed the serology work used in the prosecution of George Rodriguez during that year.

17 As discussed in the serology section of this report, between 1980 and 1992 the Crime Lab rarely analyzed biological evidence even in cases in which there was a known suspect. During this period, the Crime Lab performed genetic marker analysis and comparison to known reference samples in only 24% of the serology cases involving a suspect who is *currently in prison.*

In late 2005, in order to identify cases involving substantive analytical work performed by the Crime Lab's serologists, such as ABO typing, we developed a database of cases derived from raw data records that the Lab preserved, and then we reconfigured our sample based on that database.[18] By mid-December 2005, we had completed reviews of 80 of these substantive serology cases, which revealed a number of serious problems with the quality of the serology work. In fact, we identified major issues in 18 -- or approximately 22.5% -- of these cases. We also identified two very troubling cases -- related to defendants Dwight H. Riser and Charles E. Hodge -- in which the Crime Lab reported incorrect conclusions that were inconsistent with the actual ABO testing performed by the analysts.

In light of the serious and widespread problems we identified during our initial serology case reviews, in December 2005, we recommended to the Stakeholders Committee and HPD that we modify the scope of the serology case reviews as follows: First, because of the number of major issue serology cases we identified in which Mr. Bolding was the responsible serologist, we recommended that the time period of our case reviews be expanded to cover the years 1980 through 1993 in order to include the entire period in which Mr. Bolding performed serology at HPD as well as a short period prior to his involvement.[19] Second, we suggested that our reviews be limited to cases in which the Crime Lab's serology work related to a suspect who was convicted of the crime under investigation, either by guilty plea or as a result of a trial verdict. We made our proposal to change the basis of our case selection in serology from random sampling, which was designed to provide a cross section of the work performed by the Crime Lab to permit assessments of its overall quality, in order to concentrate our efforts on systematically attempting to identify cases in which flawed serology work by the Lab may have played a role in a criminal conviction. In short, because the original serology work we reviewed appeared to be so deeply and pervasively flawed, we believed that continuing with the random sampling would have further confirmed the conclusions that we had already reached while potentially failing to identify specific, individual cases in which flawed work by the Crime Lab may have contributed to a miscarriage of injustice.

---

18 The Crime Lab was not able to locate and provide us with raw data related to the work performed by all of the serologists employed by the Lab during the relevant period. Most of the serology raw data records that have been preserved are those originally maintained by HPD analyst Christy Kim dating back only to 1989.

19 Our review of serology cases from the early 1980s found that Mr. Bolding began issuing serology reports in October 1980. Mr. Bolding did not attend a formal outside training program in bloodstain analysis until the summer of 1982.

HPD and the Stakeholders Committee approved our recommended changes in the selection criteria for the serology case reviews, and we implemented the revised approach in January 2006.[20] In coordination with HPD, and with its substantial assistance, we immediately began the process of identifying serology cases that might be related to actual convictions of individual defendants, which posed significant logistical challenges particularly for cases from the early 1980s that pre-dated the Crime Lab's use of an electronic case tracking system.

During our May 4, 2006 meeting with the Stakeholders Committee and HPD, we recommended that our review of the Crime Lab's historical serology cases be narrowed to include only those cases that could be tied to a conviction, either by trial or by guilty plea, and where the convicted defendant remained currently incarcerated. This recommendation to narrow the serology review was based on several factors, including (1) the resources that would be required to review the large volume of serology conviction cases that we anticipated identifying from the period between 1980 and the early 1990s; (2) the relatively small proportion of cases in which the Crime Lab performed substantive serological analysis; and (3) poor documentation contained in the Lab's serology case files, which limited our ability to assess the reliability of the results obtained by the Lab's serologists.

In light of these factors, we recommended to the Stakeholders Committee and to HPD that our review focus on serology cases related to a defendant who was currently incarcerated and, therefore, was at least in theory in a position to obtain meaningful relief through the criminal justice system. The Stakeholders Committee and HPD adopted our recommendation, and in May 2006 we again recalibrated our serology review to focus on the identification and review of serology cases related to currently incarcerated prisoners. We also reviewed all serology work performed by the Crime Lab that related to death penalty cases from 1980 through the early 1990s, including

---

20 In adopting our recommendation to expand the relevant time period of our serology case reviews to 1980, HPD and the Stakeholders Committee left open the possibility of expanding our serology case reviews even further to pre-1980 cases. Based on the lack of documentation contained in the case files from the early 1980s, and our expectation that documentation would only be thinner further back in time, we did not believe it would be fruitful to review pre-1980 serology cases. Accordingly, we recommended against undertaking a review of serology conviction cases prior to 1980, despite our profound reservations about the overall quality of the forensic serology work that might have been performed in those cases.

death penalty cases in which the defendant no longer was incarcerated because he had been executed by the time we began our review.[21]

Our review of serology cases related to incarcerated suspects was limited by the lack of documentation contained in the Crime Lab's files. In most of the cases from the 1980s, it is not possible to evaluate the serologists' interpretation of the ABO testing results they obtained because the laboratory notes and worksheets contained in the file recorded only the analysts' conclusions about the ABO factors detected and provided no information about the raw test data that would indicate, for example, the strength of the test results upon which the analysts' conclusions were based. Also, with the exception of several notebooks kept by Ms. Kim beginning in 1989 and the p30 test logs from 1990 forward maintained by former serologist Grace Daz, there are no logs or other records reflecting the raw data related to testing performed by the Crime Lab's serologists, apart from the raw data record occasionally present in the case file.[22]

Finally, during the early 1980s, Crime Lab serologists did not report conclusions as to why, based on ABO typing of evidence and comparison to reference samples, a particular suspect was included (or excluded) as a potential contributor to the evidence sample. During this period, the Crime Lab's reports typically only presented the results of ABO typing -- i.e., which ABO factors, if any, were detected -- and included no interpretation with respect to inclusions or exclusions. Essentially, for most of the serology cases performed in the 1980s, even in the relatively few cases where ABO typing actually was performed and the results were reported, no conclusions were reported as to inclusion or exclusion; consequently, we were able to evaluate only whether the serologist accurately reported the test results recorded in the analysts' worksheets.

---

21 As discussed further below, there were a total of 29 serology cases during the relevant time period related to a prisoner who had been executed by the time we began our review of serology incarceration cases.

22 Because the raw data notebooks that we obtained were prepared primarily by Ms. Kim, we were able to evaluate the serology results she reported much more thoroughly and effectively during the period for which we have such raw data than we were able to with respect to other analysts. Also, we found that Ms. Kim was an extremely prolific analyst and handled more cases than any other serologist in the Crime Lab, including Mr. Bolding. For these reasons -- the volume of her casework and our ability to more effectively review her results -- many of the major issue cases we identified were analyzed by Ms. Kim. However, the problems we have observed with the Crime Lab's serology work, including the major issues, were endemic to the Lab's serology work generally. Therefore, there is no reason to conclude that Ms. Kim's performance as a serologist was uniquely deficient.

II. Review of Current Operations

The final phase of our investigation involved the review of the current operations of the Crime Lab and Property Room. As the investigation progressed and the Crime Lab continued to implement significant changes and reforms, it became clear to us that the formulation of recommendations that would be relevant to the current state of the Crime Lab and valuable to HPD could not be based on our Phase II case reviews, which covered cases analyzed by the Crime Lab through the end of 2004 in most areas and through 2002 in DNA -- all prior to the Crime Lab's accreditation by ASCLD/LAB. In preparation for the ASCLD/LAB inspections, the Crime Lab, among other things, extensively revised its SOPs, hired and trained new analysts and managers, underwent reviews by outside consultants, and implemented a new Quality Assurance and Quality Control ("QA/QC") regime.

Therefore, in May 2006, we suggested to HPD and the Stakeholders Committee that the scope of our investigation be expanded to include a review of the Crime Lab as it currently is organized and operates, including the review of cases analyzed by the Lab after accreditation to serve as a basis for recommendations. From the outset, the Stakeholders Committee and City Council had stressed the importance of our formulating such recommendations for use in enforcing accountability on HPD and the Crime Lab. On June 22, 2006, we submitted a formal proposal to the City and HPD regarding the review of the current operations of the Crime Lab and Property Room.[23] On September 27, 2006, the City Council approved our proposal, and we resumed our review of the Crime Lab's current operations designed to support our formulation of relevant and coherent recommendations across all of the Lab's functions.

In our review of the Crime Lab's current operations, we reviewed the current SOPs for each of the forensic science disciplines currently employed by the Lab as well as its Lab-wide manuals and protocols, training and proficiency testing materials for the Lab's current analytical staff, data regarding the Lab's budget and caseload, information about the existing salary structure for Lab personnel, and incident logs and records. We also interviewed members of the Crime Lab staff to get their views about the current organization, management, and needs of the Lab.

Ultimately, the state of the Crime Lab's current operations is reflected in its work product. Accordingly, in consultation with PwC, we selected statistical samples of cases analyzed in each of the forensic science disciplines employed by the Crime Lab post-accreditation. For the types of analysis accredited by ASCLD/LAB in May 2005 --

---

[23] This proposal also discussed the identification and review of serology incarceration cases from 1980 through the early 1990s.

controlled substances, firearms, blood alcohol testing, and questioned documents -- we selected samples of cases completed and reported by the Crime Lab between June 2005 and the end of October 2006.[24] We reviewed 36 DNA cases completed by the current Biology Section after ASCLD/LAB accredited the Crime Lab's DNA operation in June 2006.[25] We also reviewed the Trace Evidence Section's SOPs, training materials, and equipment and interviewed both of the Crime Lab's trace evidence examiners. However, because the Trace Evidence Section has not yet been accredited by ASCLD/LAB, we did not review a sample of current trace evidence cases.[26]

Our review of the Property Room focused on the collection, storage, and retrieval of forensic evidence likely to be analyzed by the Crime Lab. In connection with this review, we interviewed HPD investigators and crime scene specialists; personnel in the Central Evidence Receiving ("CER"), the unit of the Crime Lab responsible for processing controlled substances evidence submitted to the Lab for analysis; Lab personnel who handle biological and firearms evidence; representatives from the District Attorney's Office who manage and store evidence transferred from HPD to be used in prosecutions; and Property Room personnel. We also reviewed the Crime Lab's and Property Room's procedures and systems for the storage, tracking, and retrieval of evidence. Finally, we reviewed historical records maintained by HPD and the Property Room, including audit and inspection reports, correspondence, and the report recently prepared by an outside consultant, James Latta, who was commissioned by HPD to evaluate and provide recommendations concerning the operations of the Property Room.

---

24 The general sampling methodology we developed in consultation with PwC was to select samples of 30 cases in each of these areas. Similar to the methodology relating to our review of historical controlled substances cases, we selected two samples of current drug cases. The first sample was a general sample drawn from the entire population of controlled substances cases processed by the Crime Lab during the relevant period. We also selected a separate sample that targeted cases involving particular types of evidence -- such as liquids, capsules, and tablets -- that are more challenging to analyze than the routine marijuana and cocaine cases that constitute the overwhelming majority of cases submitted to the Controlled Substances Section. Finally, because of the small number of questioned documents cases, we reviewed all of the cases completed by the Crime Lab's questioned documents examiner during the relevant time period

25 The DNA cases we reviewed included a sample of 30 cases completed between July and October 2006 (which represents approximately half of the DNA cases completed by the Crime Lab during that period), as well as two cases analyzed by each of the three DNA analysts who completed training and began performing casework after October 2006. We also reviewed several "mock" DNA cases analyzed by DNA staff prior to the Section's accreditation.

26 The Trace Evidence Section received a form of provisional accreditation from the Texas DPS in November 2006, which permitted the Section to move forward with developing examples of casework to be evaluated during the ASCLD/LAB inspection process.

The Structure of the Crime Lab: Historical Areas of Operation

HPD founded the Crime Lab in 1953. Since then, there have been only four directors of the Crime Lab -- Floyd McDonald from 1953 until his retirement in 1983; Peter Christian from 1983 until his death in 1995; Donald Krueger from 1995 until his resignation on February 21, 2003; and Irma Rios, who has led the Crime Lab since October 20, 2003.[27]

Four fundamental forensic science disciplines were practiced in the Crime Lab under Mr. McDonald -- toxicology/breath-alcohol testing, controlled substances analysis, trace evidence examination, and serology. Throughout much of its history and until the early 2000s, the Crime Lab housed HPD's photography laboratory in addition to the forensic science disciplines. The examination of latent prints, however, was never included under the Crime Lab -- that function is performed by officers in HPD's Identification Division. During the years 1992 through 1997, the firearms examination function also was located in the Identification Division.

By 2004, the Crime Lab settled into roughly its current organization. The forensic science disciplines currently practiced in the Crime Lab are (1) biological evidence analysis, including serology and DNA profiling; (2) controlled substances analysis; (3) firearms examination; (4) trace evidence examination; (5) blood alcohol testing and administration of HPD's field breathalyzer program; and (6) questioned documents examination.

I. Serology

Historically, forensic serology involved the identification of physiological fluids (e.g., blood, semen, and saliva) in evidence samples and the comparison of such samples with known reference standards based on the analysis of genetic markers, such as the ABO blood group system and other polymorphic enzyme and protein systems. Following the development of DNA profiling technology in the late 1980s and early 1990s, the term serology in most forensic laboratories (including HPD's) has come to refer only to the identification of fluids and stains that might contain DNA.

---

27 Robert Bobzean, who was the deputy director of the Crime Lab at the time, functioned as the acting head of the Lab immediately following Mr. Krueger's resignation. In July 2003, Frank Fitzpatrick of the Orange County Sheriff-Coroner's Office was brought in as the interim director of the Crime Lab, a role in which he served until Ms. Rios was hired.

Serology -- more specifically, testing to screen evidence for the presence of blood or semen and ABO blood typing -- was practiced in the Crime Lab prior to 1980, which was the first year covered by our review of the Lab's historical serology cases. We identified 17 different analysts who performed serology work in the Crime Lab during the 1980s and early 1990s, including Mr. Bolding who became the Lab's lead serologist in the early 1980s.

In the early 1990s, HPD's Serology Section evolved into its DNA/Serology Section as the Crime Lab's DNA analysis capability came on-line. Mr. Bolding continued as the leader of the new DNA/Serology Section, and former serologists, such as Christy Kim, trained in DNA analysis. After the advent of DNA analysis in the Crime Lab, certain analysts continued to be devoted full time to serology; they were involved primarily with screening evidence stains for body fluids and extracting DNA from evidentiary samples.

After the DNA Section closed in December 2002, the Crime Lab continued to perform serology work, which at the time involved primarily the processing and screening of sexual assault kits. In May 2005, the Crime Lab received ASCLD/LAB accreditation in serology.

II. DNA

In the late 1980s, Mr. Bolding led the effort to acquire the necessary funding, equipment, and staff to establish a forensic DNA analysis unit in the Crime Lab. The Crime Lab began performing DNA profiling work in the early 1990s. Before the Crime Lab established its in-house DNA analysis capability, it outsourced a relatively small number of cases to outside laboratories, such as the Baylor College of Medicine, for forensic DNA analysis.

Mr. Bolding was the head of the DNA/Serology Section from its beginning through the closure of the Section in December 2002, following public reports that raised questions about the integrity of the Lab's DNA work and prompted an outside inspection of the Section. From 1993 through August 1996, Dr. Baldev Sharma was the line supervisor for the DNA/Serology Section, which was staffed with four DNA analysts and three serologists. In 1996, as a result of a prolonged series of disputes between Mr. Bolding and Dr. Sharma and questions about Dr. Sharma's competence, Mr. Krueger removed Dr. Sharma as the line supervisor for the Crime Lab's DNA analysts, and thus the Section was left without a supervisor until it was closed.

The Crime Lab did not perform forensic DNA profiling work between December 2002 and July 2006. After significant work reforming the Crime Lab's DNA operation -- including re-writing the DNA SOPs, hiring a new technical leader and DNA case

manager, hiring and training new analysts, and validating new DNA analysis instruments -- the Lab received provisional ASCLD/LAB accreditation in DNA in June 2006 and resumed DNA analysis in active investigations.

III. The Controlled Substances Section

Drug analysts use a wide range of techniques and technologies to identify controlled substances, including microcystalline tests, chromatography, mass spectrometry, spectrophotometry, and microscopic identification. All of these methods of identification have been used by forensic scientists in the Controlled Substances Section.

The Controlled Substances Section analyzes the vast majority of cases processed by the Crime Lab -- between 14,500 and 16,000 cases each year during the 1996-2004 period. Throughout the 1990s and 2000s, the Controlled Substances Section has had the most analysts of any section in the Crime Lab. The Controlled Substances Section received ASCLD/LAB accreditation in May 2005.

IV. The Firearms Section

Forensic examination of firearms-related evidence typically involves microscopic comparison of markings on bullets, cartridge casings, and shot shells; test firing of firearms to evaluate proper function; trigger pull determinations; serial number restorations; and muzzle-to-target distance determinations. Fired ammunition components can be matched to the weapon that fired them, link different crimes committed with the same weapon, and, thanks to nationwide tracking programs, provide leads for investigators and useful data for laboratories across the country.

In approximately 1991, the Firearms Section was moved out of the Crime Lab Division and placed in the Identification Division, where it remained for seven years. The Firearms Section rejoined the Crime Lab, effective on or about March 30, 1998, after the Lab moved from 33 Artesian Place to its current location in HPD headquarters at 1200 Travis Street. The Firearms Section received ASCLD/LAB accreditation in May 2005.

V. The Trace Evidence Section

Trace evidence -- such as hair, fiber, gunshot residue, paint, and glass -- may be transferred between individuals and objects during the commission of a crime. The Trace Evidence Section of the Crime Lab was historically involved in analyzing such evidence, as well as processing a significant volume of arson-related evidence. The Trace Evidence Section traditionally has been relatively small -- only one or two analysts in addition to a supervisor. In the past, HPD trace evidence examiners

analyzed arson cases. However, in 2003, responsibility for the investigation of suspected arson incidents was transferred to the Office of the Harris County Fire Marshal.

The Crime Lab currently employs two trace examiners, whose work is technically reviewed by an outside expert. The Trace Evidence Section received a form of accreditation from the Texas DPS in November 2006, and underwent its first ASCLD/LAB inspection in March 2007.

VI. The Toxicology Section

Forensic toxicology involves the detection and identification of alcohol and other drugs in body fluids such as blood and urine. The Crime Lab's historical Toxicology Section oversaw the calibration and maintenance of breath testing devices used by HPD officers in the field and trained officers in their use. In 2003, the longtime head of the Toxicology Section, Pauline Louie, failed a toxicology competency test, and the Crime Lab ceased performing traditional toxicological analysis. Since then, the Crime Lab has only performed blood alcohol testing, for which it received ASCLD/LAB accreditation in May 2005.

VII. The Questioned Documents Section

Until 2004, the examination of questioned documents was a component of the Identification Division. HPD formerly employed several document examiners, but the operation was closed in the mid-1980s during a period of examiner attrition and waning requests for document examinations. For approximately fifteen years (from the mid-1980s until 1999), document examination requests generated by HPD investigators were referred to the Texas DPS crime laboratory. HPD currently has one questioned documents examiner, who was hired in 1999.

A change in Texas state law, which permitted only forensic science evidence analyzed by accredited laboratories to be admitted in Texas courts, prompted the transfer of HPD's lone questioned documents examiner from the Identification Division to the Crime Lab in 2004. The Crime Lab's Questioned Documents Section received ASCLD/LAB accreditation in May 2005.

Brief Narrative History of the Crime Lab (1953 – 2005)

This section of the report is a narrative history of the Crime Lab between its founding in 1953 and May 10, 2005, when the Crime Lab was accredited by ASCLD/LAB in the disciplines of controlled substances, blood alcohol analysis, questioned documents, firearms, and serology.[28] The mismanagement, dysfunction, and technical failings that ultimately led to the sustained crisis that engulfed the Crime Lab starting in late 2002 have their origins in practices and attitudes that were present at HPD and in the Crime Lab more than twenty years ago.[29] This narrative history of the Crime Lab provides the background and context for the severe and widespread problems revealed by our review of the Crime Lab's casework, particularly in the areas of serology and DNA analysis.

I. Early History of the Crime Lab

HPD's Crime Lab was established in 1953. For thirty years until his retirement in 1983, Floyd McDonald served as the Crime Lab's first and only director.[30] The Crime Lab was located at 61 Reisner Street until the late 1980s, when it moved to 33 Artesian Place. In 1997, HPD headquarters and the Crime Lab moved to their current location at 1200 Travis Street.

Under Mr. McDonald, the Crime Lab performed four types of forensic analysis -- toxicology/breath alcohol testing, controlled substances analysis, trace evidence examination, and serology. Although the Crime Lab staff tended to specialize in certain areas of analysis, most of the Lab's analysts during this period were generalists and had case experience in more than one discipline, as was typical in most crime laboratories

---

28 The ASCLD/LAB accreditation that the Crime Lab received in May 2005 did not include DNA analysis or trace evidence examination.

29 For the reasons detailed in this narrative history of the Crime Lab it would not be fair or consistent with the facts to absolve the rest of the Department for the Lab's failures. One of the root causes of the Crime Lab's problems, which we discuss below, was the failure of previous administrations of HPD and the City to provide the Lab with the resources necessary to attract and retain qualified forensic scientists and laboratory managers, provide analysts with necessary training and technical guidance, and maintain an appropriate laboratory environment

30 After retiring from HPD in 1983, Mr. McDonald founded the Pasadena (Texas) Police Department's crime laboratory. Over the years, several HPD criminalists left the Crime Lab to work in the Pasadena lab, including that laboratory's current director.

around the country. For example, when Mr. Krueger started in the Crime Lab in 1978, he was primarily a controlled substances analyst. Eventually, Mr. Krueger concentrated on the examination of trace evidence. However, he also worked serology cases from at least 1980 through 1983.[31]

In the very early days of the Crime Lab, all analysts, including Mr. McDonald, were sworn police officers, known at HPD as "classified" employees. The long-term Crime Lab employees whom we interviewed believe that Mr. McDonald had close relationships with members of the HPD command staff and was reasonably effective in obtaining resources and equipment for the Lab, including the Lab's first gas chromatograph/mass spectrometer ("GC/MS") [32] in the late 1970s.[33]

Over time, the Crime Lab became increasingly civilianized, in part as a cost-saving measure relative to its treatment of classified officers: HPD traditionally paid civilian employees less and afforded them fewer employment-related benefits. Thus, as demands on the Crime Lab increased throughout the 1970s and early 1980s, the Lab under Mr. McDonald found it could staff more new analyst positions if those positions were held by civilians rather than by sworn officers. By the early 1980s, the number of classified positions within the Crime Lab had become frozen, and the opportunity for an employee to become classified was available only if a vacancy in an existing classified position was created by a departure or retirement.

When Mr. McDonald retired in 1983, his deputy, Peter Christian, became the head of the Crime Lab. A competitive examination was administered within the Crime Lab to determine who would be promoted to be Mr. Christian's deputy, a classified position. Mr. Bobzean and Mr. Krueger, who joined the Crime Lab in August 1972 and November 1978, respectively, competed, along with a third Lab analyst, for the number two spot in the Lab. Mr. Krueger scored highest on the test, was classified, and was promoted to the assistant director position. [34]

---

31 Mr. Krueger told us that he received training in serology testing techniques while he was a criminalist in a forensic science laboratory in San Antonio, Texas before arriving at the Crime Lab.

32 A GC/MS is an essential laboratory instrument that separates, identifies, and quantifies the components of complex mixtures. The gas chromatograph separates components of mixtures and directs them into the mass spectrometer where they are identified by patterns unique to each chemical compound. Mass spectrometry has its widest application in the identification of drugs.

33 We make no suggestion -- and we have found no evidence -- that Mr. McDonald engaged in any form of misconduct in obtaining resources for the Crime Lab.

34 Mr. Bobzean eventually attained classified status as well.

As discussed in the following section, the distinction between classified and unclassified -- i.e., sworn officers and civilians -- was significant at HPD in terms of salary, benefits, and respect afforded within the Department. Nearly all of the individuals whom we interviewed had been long-term employees in the Crime Lab and believed that the Department traditionally regarded civilian employees as second-class citizens. We were told that Crime Lab personnel generally felt that, serving in a division within the support services command -- as opposed to an operations command -- that was populated predominantly by civilian analysts, the Lab was relegated to a doubly marginalized status in the eyes of high-level HPD executive command staff and budget planners.

II. Compensation, Personnel, and Workload

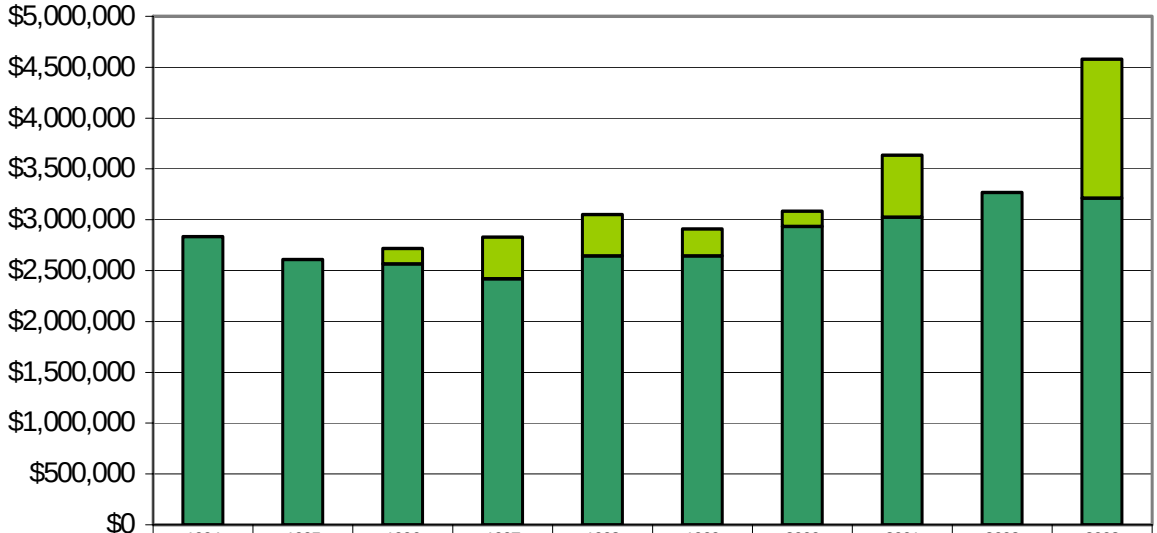
In addition to focusing on issues relating to the internal operations of the Crime Lab -- including examiner competence, training, and laboratory management -- our investigation also reviewed issues relating to resource allocation by the City and HPD to the Lab. One thing is clear: until the public crisis engulfed the Crime Lab, it was never provided adequate financial support to hire and train the number of criminalists necessary to handle the Lab's ever-increasing workload, pay the salaries required to attract and retain qualified forensic scientists, acquire much-needed equipment and supplies, and maintain and repair the Lab's infrastructure. [35]

The following chart tracks the Crime Lab Division's total allocated budgets during the ten-year period between 1994 and 2003. As reflected below, the dollars that the Crime Lab received from HPD's general fund remained relatively flat through the late 1990s and increased only slightly in the early 2000s in absolute dollars, not adjusted for inflation. The Crime Lab relied heavily on grant money, which in some years was either not available or not obtained. The significant spike in grant funding that the Crime Lab received in 2003 related to a $1.1 million grant through the "No Suspect Casework DNA Backlog Reduction Program," which was largely used to outsource unanalyzed rape kits to private labs after the DNA Section was closed in December 2002.

---

[35] Prior to the re-organization of the Crime Lab in 2005, forensic scientist positions in the Crime Lab were classified as Criminalist I through IV. Criminalist I was the entry level position for personnel conducting forensic science analysis in the Crime Lab; Criminalist II was the more advanced position for a working analyst; Criminalist III was the title for first-line forensic science supervisors; and Criminalist IV was the top-level supervisory position, which generally involved the supervision of multiple sections in the Lab.

HPD Crime Lab Budget Funding
1994-2003



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Grant Funding	$0	$0	$150,071	$411,372	$405,448	$264,260	$149,632	$610,506	$0	$1,362,080
General Budget Funds	$2,834,299	$2,608,706	$2,567,365	$2,419,787	$2,646,965	$2,646,761	$2,934,556	$3,024,618	$3,269,591	$3,215,555

Throughout the history of the Crime Lab, the salaries HPD paid to civilian employees in the Lab were not only lower than salaries paid to HPD sworn officers but also were lower than those paid by other publicly-funded forensic science laboratories in the region and around the country. For example, HPD job postings issued in 1993 show that the salary range for Criminalists I was $21,138 - $28,574, Criminalists II was $24,440 - $33,332, and Criminalists III was $29,146 - $40,456. According to job postings collected by the Crime Lab at the time, the Kansas Bureau of Investigation, by comparison, advertised salaries in 1993 for Forensic Scientists I in the range of $25,728 - $36,192 and for Forensic Scientists II in the range of $31,260 - $43,992 -- a range providing higher salaries than those offered by HPD for even its most experienced line supervisors. Senior criminalists in the Mesa, Arizona Police Department Crime Lab in 1993 were paid between $40,443 and $54,574, which is between 34 and 39% higher than HPD's salary range for Criminalists III.

In 1998, Crime Lab personnel conducted a salary survey that compared the salaries paid to Crime Lab analysts with the salaries for comparable level analysts in the DPS, Harris County ME's Office, and the Pasadena (Texas) Police Department.

According to this survey, which was provided to Chief Bradford, the average salaries paid by these three Houston-vicinity crime labs were 20% higher for Criminalists I and II, 6% higher for Criminalists III, and 14% higher for Criminalists IV. The salary survey process that began in 1998 eventually resulted in pay increases of 12% for Criminalists I, 9% for Criminalists II, and 4% for Criminalists III in the fall of 2002. While these pay raises no doubt were welcome, HPD Crime Lab employees remained undercompensated relative to their peers at other Houston-area labs as of late 2002.

The low salaries offered by HPD made it difficult for the Crime Lab to recruit qualified scientists and to retain them after they received training. The problem was exacerbated by the lack of opportunities for promotion and advancement within the calcified employment structure of the Crime Lab. Mr. Krueger told us that his repeated attempts to secure step increases in pay for Crime Lab analysts were turned aside. It was not uncommon for entry-level analysts to spend a short time at the Crime Lab, gain training and work experience, and then leave for higher paying jobs in other laboratories. Mr. Krueger told us that economic downturns worked perversely in the Crime Lab's favor because during slow economic times the Lab was able to hire the better-qualified personnel and retain them for longer periods of time.

Historically, many Crime Lab analysts worked second jobs. Even Mr. Krueger and Mr. Bolding had outside employment while they were senior managers in the Crime Lab -- Mr. Krueger worked in an underwater photography store and Mr. Bolding ran an antiques store. Indeed, the Crime Lab's hours of operation -- from approximately 7 a.m. to 3 p.m. -- appear to have been structured to permit analysts to have outside employment in the afternoons and evenings. While these hours facilitated outside employment, they limited hours during which analysts were available to communicate with prosecutors, investigators, and others.[36] Given the comparatively low salaries that were offered to Crime Lab personnel, it is easy to understand the strong attraction outside employment held for many analysts, but the prevalence of outside employment -- even among the Lab's senior managers -- contributed to a culture that did not reflect sufficient commitment to the work of the Lab.

From the 1990s through the early 2000s, numerous authorized positions within the Crime Lab remained vacant due to a lack of funding. These vacancies persisted despite the steady growth in the volume of cases submitted to the Crime Lab for analysis. Although, as in most crime laboratories, the vast majority of cases referred to

---

[36] Mr. Krueger told us that he did not believe that the prevalence of outside employment impaired the performance of Crime Lab staff. Outside employment appears to be an aspect of the culture of HPD as a whole, and many sworn officers hold second jobs as well.

the Crime Lab involved controlled substances, the demand for DNA analysis increased substantially in the late 1990s and early 2000s. During this period, as discussed in greater detail later in this report, rape kits became substantially backlogged with respect to cases in which there were no known suspects. These cases were not analyzed and therefore not loaded into the Combined DNA Index System ("CODIS") database.[37] The DNA Section's *de facto* policy at the time, developed because of the workload demands placed on its limited personnel, was to conduct DNA analysis only in cases involving known suspects from whom samples had been obtained for comparison.

By 2001, the Crime Lab was struggling to cope with various workload issues, including a major spike in the number of controlled substances cases. In February 2001, Mr. Krueger assigned Dr. Baldev Sharma, the Lab's putative QA/QC supervisor, to analyze marijuana cases full time. On July 11, 2001, Mr. Krueger sent a memorandum to Chief Bradford entitled "Crime Laboratory -- Personnel Needs" in which he stated, "The caseload in the chemistry sections of the laboratory has increased rapidly in the last several years. . . . In 1994, the chemistry sections of the lab had 35 criminalists and received 13168 cases. In the calendar year 2000, the chemistry sections of the lab are still staffed with 35 criminalist [sic] and 17597 cases were received, an increase of 33.6%."[38] Mr. Krueger also explained that he intended to include requests for additional personnel in the Crime Lab's fiscal year 2002 budget, but he removed the request in light of a January 2, 2001 memorandum from the Director of Budget and Finance for HPD instructing all commands not to request new personnel in their budgets due to "fiscal constraints."

The following year, Mr. Krueger again raised the staffing issue. In a memorandum to Chief Bradford dated January 28, 2002 and entitled "Additional Information for the Position Justification Committee," Mr. Krueger advised the Chief that:

---

37 CODIS is a system that "enables federal, state, and local crime labs to exchange and compare DNA profiles electronically, thereby linking crimes to each other and to convicted offenders." CODIS is a hierarchical database with three tiers -- the National DNA Index System (NDIS) is the highest tier, with state (SDIS) and local (LDIS) databases flowing into it. *See* www.fbi.gov/hq/lab/codis/brochure.pdf.

38 As discussed in detail below, during this same period in the late 1990s and early 2000s in which the volume of drug cases submitted to the Crime Lab was growing rapidly, the DNA Section was left without a Criminalist III line supervisor and was not processing sexual assault kits to develop DNA profiles for entry into CODIS. Mr. Krueger told us that, even though DNA cases typically involve serious crimes such as homicides and sexual assaults, controlled substances was his priority for resources because of the large volume of drug cases that were flooding the Crime Lab.

> The caseload for the Chemistry Sections of the Crime Laboratory has risen steadily over the years and since 1986 there has been no increase in authorized strength other than a few grant funded positions for specific purposes (DNA and DRUGFIRE).[39]

Mr. Krueger concluded his plea for additional personnel by stating:

> Personnel have been moved; duties have been changed; analytical procedures have been streamlined, reduced and even eliminated in an attempt to maintain a reasonable level of service. Without the authorized vacancies filled[,] backlog will likely increase, delaying investigative information, grand jury indictments and court trials.[40]

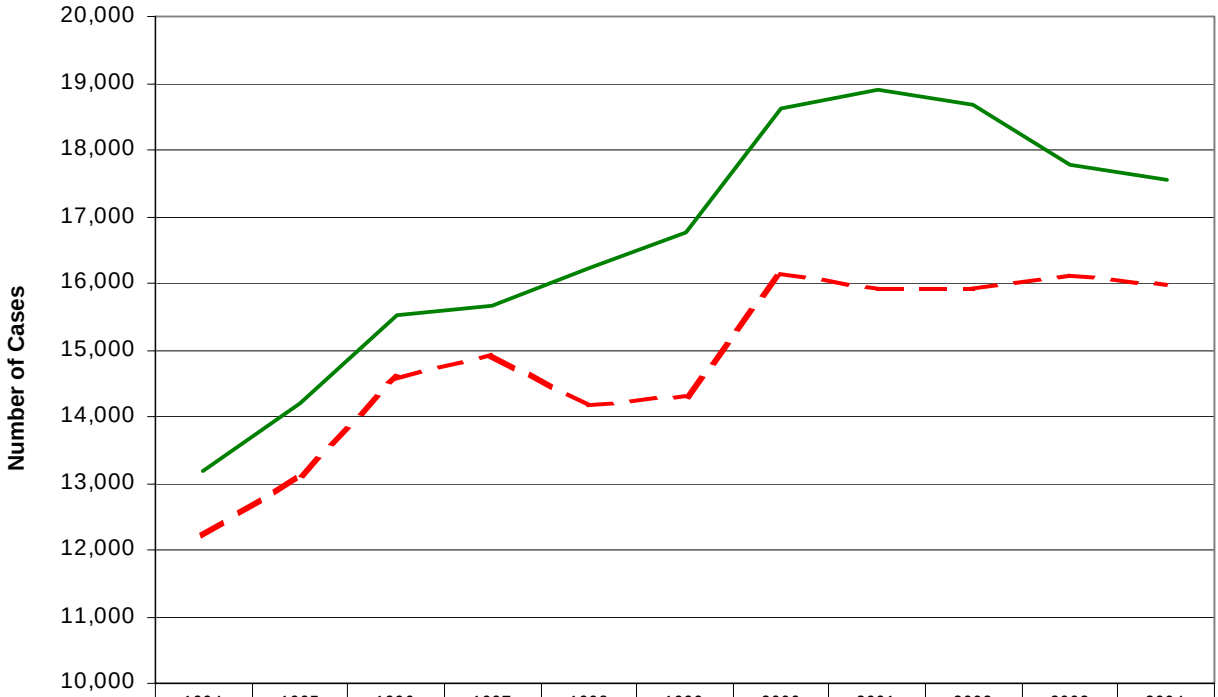
The following charts compare the growth in the Crime Lab's workload, overall and in the Controlled Substances Section, with the number of analysts employed by the Lab and the number of vacancies.

---

39 The DRUGFIRE program is a computerized forensic imaging database system into which participating forensic firearms laboratories enter images of firearms and ammunition components in order to link shootings that have taken place at different times and locations.

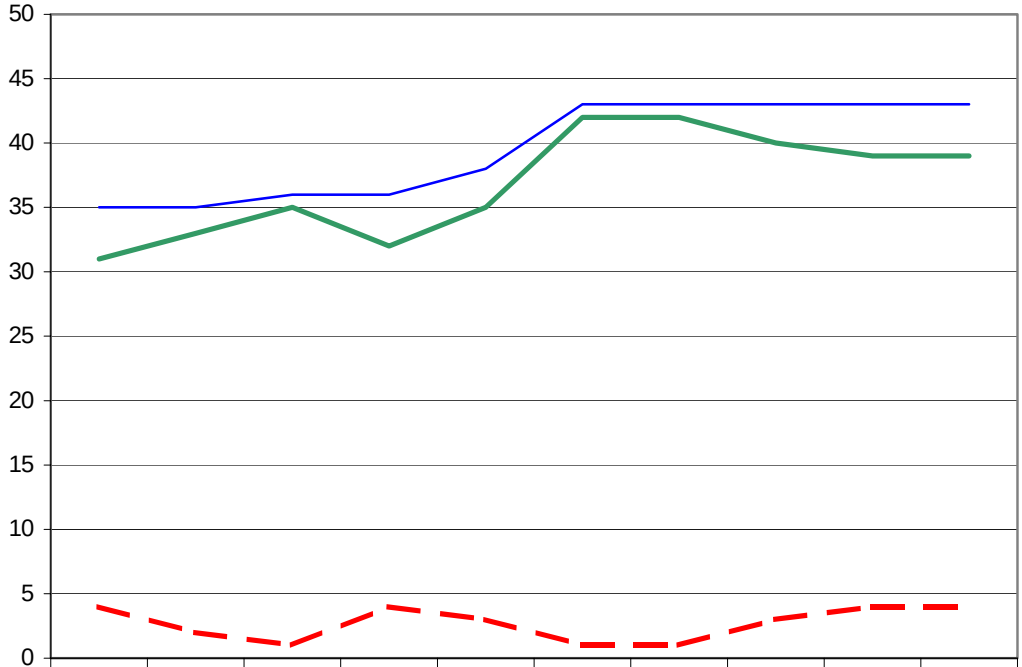
40 This memorandum was reviewed and signed by both Executive Assistant Chief Storemski and Assistant Chief Simmons.

HPD Crime Lab Cases 1994 - 2004



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Cases	13,175	14,197	15,519	15,675	16,212	16,770	18,629	18,912	18,664	17,771	17,544
Controlled Substances	12,232	13,117	14,566	14,927	14,167	14,310	16,136	15,925	15,904	16,113	15,958

HPD Crime Lab Criminalists 1994 - 2004



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Authorized Criminalists	35	35	36	36	38	43	43	43	43	43
Actual Criminalists	31	33	35	32	35	42	42	40	39	39
Vacancies	4	2	1	4	3	1	1	3	4	4

As discussed in more detail below, in 2002 the Crime Lab received an allocation of $600,000 from the City to address the substantial backlog of unprocessed rape kits that had accumulated over many years. In a June 25, 2002 memorandum to Chief Bradford, Executive Assistant Chief Storemski recommended that HPD "tak[e] this opportunity to increase DNA staffing which will benefit us in the future. . . . If we use all of the $600,000 to outsource without triage we could analyze 500 to 1000 cases. If we hire additional personnel as recommended and triage the cases, and then use the remaining $300,000 to outsource we could analyze 1071 to 2500 cases." In a handwritten note, Chief Bradford rejected Executive Assistant Chief Storemski's recommendation that a portion of the $600,000 be used to hire additional DNA analysts -- including filling the Criminalist III DNA supervisor position that had been vacant since 1996 -- stating: "We can not hire new personnel. This is a 'one-time' pool of money." Chief Bradford was unwilling to use this temporary source of funding to fill criminalist positions that eventually would require a funding commitment by HPD. Therefore, the staffing problems that led to the rape kit backlog in the first place went unaddressed by Chief Bradford despite the substantial influx of funds from the City.

The results of our extensive review of the Crime Lab's cases reflect that the Lab's staff, particularly its DNA analysts, was woefully undertrained. Among other things, the 2002 DPS audit found that the Crime Lab lacked "a documented program to ensure that technical qualifications are maintained through continuing education." We were told that funding for training was among the first areas to be trimmed when the Crime Lab faced budget cuts. Indeed, even after the 2002 DPS audit and the closure of the DNA Section, Mr. Krueger was under pressure to reduce his budget. In a January 28, 2003 memorandum to Chief Simmons regarding "FY04 Budget Cuts," Mr. Krueger wrote: "The FY03 budget has already been reduced; most notably a 23% reduction in training." Numerous Crime Lab analysts told us that they felt inadequately trained and that they confronted many obstacles in obtaining offsite training. This lack of training and the isolation of analysts from the forensic science community proved to be truly one of the most significant factors contributing to the collapse of the DNA Section.

III. The Roof at 1200 Travis Street

The working space in which HPD scientists performed sensitive forensic testing on evidence, including biological evidence related to homicides and sexual assaults, was continuously exposed to contamination due to persistent leaks and flooding caused by the HPD headquarters' faulty roof. The City and HPD's failure over a period of more than six years to repair the roof over the Crime Lab illustrates the lack of regard the Department had for the Lab and for the forensic science work performed at HPD prior to the onset of the crisis starting in late 2002.

The building at 1200 Travis Street, which became the headquarters for HPD in the fall of 1997, was built in the 1960s. In October 1994, the City purchased the building, and, in February 1995, it hired a contractor to begin renovations, including the installation of a new roof. The City and HPD were aware of problems with the building's roof prior to moving into the facility. A memorandum to Chief Bradford dated May 9, 1997 reported that there was a "problem causing water to get under the new roofing materials and saturate the new roof from underneath." In February 1998, repairs to the roof were discontinued, and, for the next nearly five years, until January 2004, the project to repair the roof was on hold while the City attempted -- with minimum energy and no results -- to hire contractors to design and construct a functioning roof for the building.

In the meantime, most of the components of the Crime Lab -- including the DNA/Serology, Controlled Substances, Toxicology, and Trace Evidence Sections -- were operating on the 26th floor at 1200 Travis Street, which is the top floor of the building.[41] In a September 1998 memorandum to Chief Bradford reporting damage to the Crime Lab following a major storm, Mr. Krueger wrote: "The Crime Laboratory Division has experienced leaks from the roof since its move to 1200 Travis in August 1997." In this memorandum, Mr. Krueger advised Chief Bradford that "[a]pproximately fifty different leaks have been identified on the 26th floor."

In May 2001, Tropical Storm Allison hit Houston, and, due to problems with the roof, the storm caused significant damage to the Crime Lab. Not only was the ceiling of the Crime Lab damaged and certain equipment affected, but also a significant volume of evidence related to homicides and sexual assaults was water-damaged. On May 11, 2001, Mr. Krueger reported to Assistant Chief Simmons:

> Thirty-four Homicide and Sexual Assault cases, in the Trace/Serology vault on the 26th floor, were badly water damaged. Many of these cases have been at least partially analyzed. At this time it appears that most of the items will dry to the state that the evidence will not be totally ruined.

In a June 18, 2001 status report, Mr. Krueger advised Chief Simmons that "[t]hirty-five Trace/Serology/DNA cases were damaged and segregated to begin drying." In 2003, several Crime Lab employees told IAD investigators that this biological evidence had become so saturated with water that they observed bloody water dripping out of the boxes containing the evidence and pooling on the floor.

---

41 The main Crime Lab is located on the 26th floor of the building. The Firearms Section is on the 24th floor, and CER is on the 25th floor.

It is unclear how the Crime Lab ultimately handled the evidence in the 34 or 35 cases damaged by roof leaks during Tropical Storm Allison. The Crime Lab did not prepare a contemporaneous incident report documenting the flooding and identifying the affected cases. In 2003, Mr. Bolding told IAD investigators that he believed all of the evidence in those cases already had been analyzed and was awaiting return to the Property Room, which is inconsistent with the initial report Mr. Krueger provided to Assistant Chief Simmons in 2001. It also does not appear that the Crime Lab was able in 2003 -- two years after the storm -- to identify the specific cases associated with the evidence affected by the flooding.[42]

Although the chain of command above the Crime Lab was aware that the roof was leaking and that the leaks had affected evidence, no relief was forthcoming. The Crime Lab was forced to continue operating under the most troubling of environmental and facility-related conditions. For example, on July 9, 2001, Mr. Bobzean rather poignantly requested Assistant Chief Simmons to authorize the use of an HPD purchasing card to procure a wet/dry vacuum so Crime Lab employees would not have to "use[] mops to clean up after heavy rains."

IV. The Slow Descent into Crisis: The Development and Unraveling of the Serology and DNA Functions

A. Peter Christian's Management of the Crime Lab

During Peter Christian's tenure as head of the Crime Lab from 1983 until his death in March 1995, the field of forensic science underwent a technological revolution, particularly with the development of DNA profiling technology. As described in the following section, under Mr. Christian, the Crime Lab established the initial capability to perform DNA analysis in the early 1990s.

We learned from senior Crime Lab personnel who served under both of the Lab's first two directors that Mr. Christian was not as effective in asserting the interests of the Lab with the HPD chain of command as Mr. McDonald had been. Mr. Christian suffered from chronic health problems, including heart and back ailments, which caused him to be absent from the Crime Lab for significant periods of time. During Mr. Christian's absences, Mr. Krueger would assume leadership of the Crime Lab.

---

42 In March 2003, Mr. Bolding requested that the Crime Lab staff provide any information they had regarding specific cases damaged by the roof leak and how the cases were handled. All of the written responses to Mr. Bolding's inquiry that we found indicate that the Crime Lab employees had no information about which cases were specifically affected.

During Mr. Christian's tenure, the work environment of the Crime Lab began to deteriorate. By 1987, there were already hints of the personnel problems that would become even more distracting and debilitating in the DNA/Serology Section throughout the 1990s and early 2000s. In a memorandum to Chief of Police Lee P. Brown, dated November 13, 1987 and entitled "Serology Section Work Load Increase," Mr. Bolding complained that "the loss of trained staff and the increase in paperwork has had a devastating effect on sectional proficiency." Mr. Bolding stated that workload problems in the Serology Section were "exacerbated by disgruntled employees" and that "[a]ccusations of incompetence and personal prejudice are part of my daily schedule."

On January 25, 1993, five Crime Lab analysts directed a memorandum to Chief of Police Sam Nuchia in which they complained about the lack of opportunity for promotion, inequities in the evaluation system, and ethnically derogatory remarks made by certain Lab employees about their colleagues. Attached to the memorandum was a diagram of the Crime Lab purporting to show that the Lab workbenches were segregated by race.

In 1994, Chief Nuchia developed a "Plan of Action for the Reversal of Civilianization," which would have given Crime Lab employees who met certain requirements the opportunity to become classified officers with the attendant salary and employment benefits. Although the Crime Lab supervisors and analysts generally supported the initiative to reverse the gradual civilianization of the Lab, they also had several reservations about the plan. In a memorandum to Chief Nuchia dated February 28, 1994, twenty-four Crime Lab analysts stated that, while they appreciated the opportunity to receive the "benefits, career opportunities, and salary compensation" associated with classification, they had several concerns, including the physical requirements for classification and the proposed abolition of a civilian career ladder in the Lab. The memorandum concluded that "we feel that the reversal of civilianization, as it [is] proposed will be detrimental to the Houston Police Department Crime Laboratory." A program to classify Crime Lab supervisor and analyst positions was never implemented.

Although morale problems appeared to be growing during Mr. Christian's tenure, there was relatively open communication among personnel in the Crime Lab during the period when he headed the Lab. Supervisors and analysts participated in monthly Crime Lab-wide meetings led by a rotation of supervisors from the various sections. According to the agendas of these meetings, topics of discussion included personnel and divisional concerns, safety, budget, cases of note in the Crime Lab, and initiatives, such as the development of the DNA Section.

After Mr. Christian passed away and Mr. Krueger became the head of the Crime Lab in March 1995, the monthly meetings continued for a time and then abruptly stopped.[43] Mr. Krueger reduced the frequency of staff meetings to approximately once or twice a year, believing the monthly meetings had lost their utility since they tended to devolve into "gripe sessions" over issues such as low pay.

B. Serology in the 1980s

Mr. Bolding joined the Crime Lab in October 1979 and worked as a drug chemist for approximately eighteen months. In the spring of 1981, the Crime Lab's head serologist invited Mr. Bolding to train in serology in order to replace recent departures from the Lab. Mr. Bolding described his serology training as consisting of less than five months of on-the-job training under the supervision of the head of serology. Less than a year after Mr. Bolding began training in serology, his supervisor died. Mr. Bolding had not yet received any formal training in fundamental serological techniques, including ABO blood typing. Mr. Bolding told us that he "took books home and did the best he could." Mr. Bolding was the head serologist in the Crime Lab, and, on November 14, 1981, he was promoted to Criminalist II.

In July 1982, Mr. Bolding successfully completed an intensive course in bloodstain analysis at the Serological Research Institute ("SERI") in Emeryville, California. That same month, and less than a year after his promotion to Criminalist II, Mr. McDonald recommended that Mr. Bolding be promoted to Criminalist III "as soon as possible" because he "is the only Criminalist II we have who is a qualified and experienced Forensic Serologist and he has recently completed the SERI course in Forensic Serology." In the fall of 1982, Mr. Bolding was promoted to Criminalist III, despite his minimal experience in serology.

The rapid promotion of Mr. Bolding as HPD's lead forensic serologist would prove fateful for the quality of the Crime Lab's analysis of biological evidence for decades to come. With Mr. Bolding, the Crime Lab never had a well-trained or technically competent leader of its Serology Section.

As discussed in detail later in this report, our review of over 1,000 serology cases processed by the Crime Lab during the 1980s and early 1990s uncovered a massive number of very serious analytical and reporting problems that were striking departures from the generally accepted forensic science principles prevailing during that time

---

43 The monthly meetings continued until shortly after the Crime Lab moved to its current location in HPD headquarters at 1200 Travis Street in late 1997. The most recent monthly meeting agenda we located for the Crime Lab during Mr. Krueger's tenure is dated August 9, 1995.

period. Although we identified sixteen different analysts, in addition to Mr. Bolding, who performed serology work in the Crime Lab between 1980 and 1992, we observed the same deeply flawed practices across the entire body of the Lab's forensic serology cases, regardless of the analyst. Such practices included:

- consistent failure to report findings indicating a rare ABO type;
- omission from the Crime Lab's reports of potentially probative typing results that were not consistent with a known victim or suspect;
- failure to perform typing work even in cases where there was a positive screen for the presence of blood or semen; and
- nearly ubiquitous failure to apply and to properly interpret critical controls.

Moreover, there was no meaningful quality assurance program, including regular and competent technical reviews, in place in the Serology Section under Mr. Bolding.

All of these serious problems either developed under, or were perpetuated by, Mr. Bolding to the point of defining the engrained culture of forensic serological analysis in the Crime Lab. Unfortunately, but not surprisingly, many of these same practices -- including selective reporting, ignorance of proper controls, and lack of quality control and technical reviews -- carried over into the Crime Lab's DNA work, which also was supervised by Mr. Bolding and performed by some of the same analysts. For example, Christy Kim joined the Crime Lab in 1982 and conducted ABO typing throughout the 1980s before moving on to DNA analysis. However, during the 1990s and early 2000s, the problems with the Crime Lab's serology program came to thoroughly infect its DNA program and assume even more ominous potential because of the increased power of DNA analysis.

C. Development and Management of the DNA/Serology Section (1991-2002)

Forensic DNA profiling was pioneered by Sir Alec Jeffreys, a professor at Leicester University in England. Professor Jeffreys' DNA profiling technique was first employed in 1988 in connection with a criminal investigation in the famous Colin Pitchfork case, in which DNA analysis was used to exonerate a wrongly accused young man and to identify and help convict a man who murdered two 15-year-old girls. Since then, DNA profiling has become an extremely sophisticated and effective scientific tool in criminal investigations and is now a fundamental discipline employed in most crime laboratories.

In the late 1980s, Mr. Bolding began to advocate for the addition of DNA analysis capability to the Serology Section. Mr. Christian, who was skeptical about serology in general, was slow to recognize the potential of DNA profiling and was reluctant to make changes at the Crime Lab to accommodate developing a DNA capacity. Mr. Krueger told us that he and Mr. Bolding had difficulty convincing Mr. Christian that DNA profiling was real science and not merely a forensic science fad.

In 1989, Mr. Bolding obtained Mr. Christian's agreement that, if Mr. Bolding were able to secure grant funding, he could move forward with establishing a DNA unit. That year, Mr. Bolding obtained approval from the Houston-Galveston Area Council for a $300,000, five-year grant to start the DNA Section.[44] The DNA Section's initial heavy reliance on grant funding for equipment and technological improvement, which existed from the very beginning, would continue throughout the 1990s and early 2000s.

With the initial funding, the Crime Lab, in 1989, hired two analysts for the newly created DNA/Serology Section, including Dr. Baldev Sharma, who received a Ph.D. in Chemistry from Delhi University's All India Institute for Medical Sciences in 1966. Prior to joining the Crime Lab, Dr. Sharma had no experience in forensic science and only a basic theoretical knowledge of molecular biology. From November 26, 1989 through December 20, 1989, Mr. Bolding and Dr. Sharma attended the FBI Academy's Laboratory Application of DNA Typing Methods School, which covered restriction fragment length polymorphism ("RFLP") analysis. Upon returning from the FBI Academy, Mr. Bolding and Dr. Sharma adopted the training manuals they had received from the FBI into the "SOPs" for the DNA Section.

In 1990, the DNA Section hired two more analysts, including Joseph Chu, and Ms. Kim began performing DNA work, which brought the size of the DNA Section to five analysts under Mr. Bolding. It took approximately a year for all of the new equipment needed for DNA analysis to arrive and to reconfigure the Crime Lab to include a "hot room" for the labeling and handling of the radioactive probes used in RFLP analysis. The DNA Section began performing actual casework in early 1991. While the DNA/Serology Section under Mr. Bolding was working to establish the necessary infrastructure to bring RFLP analysis on-line, HPD outsourced cases requiring DNA analysis to outside laboratories including the Baylor College of Medicine.

---

44 This original grant was of a "descending funding variety" that required the City to assume an increasing proportion of the funding responsibility for the grant each year. We understand that this same grant mechanism was used to develop a DNA capacity in the Harris County Medical Examiner's Office during this same period.

Mr. Bolding deserves credit for recognizing the power and potential of DNA analysis. However, Mr. Bolding was not qualified to create and lead a DNA program, and the implementation of the Crime Lab's DNA capacity was flawed from the beginning.

1. Dr. Sharma's Difficulty with RFLP Analysis

Although Mr. Bolding attended the FBI training in RFLP analysis in 1989 and an FBI course in Advanced Aspects of Forensic DNA Analysis in 1992, he did not perform any analysis of the post-training samples required by the FBI to receive full course credit and, in fact, never performed casework analysis personally. Rather, Dr. Sharma supervised the casework performed by more junior analysts in the DNA/Serology Section. Dr. Sharma experienced profound difficulty generating conclusive results through RFLP analysis because, while he was able to extract DNA, his manual RFLP technique tended to generate weak or diffuse bands that made determinations difficult, if not impossible.

Mr. Bolding told us that, in some cases when Dr. Sharma failed to obtain results through RFLP analysis, he would request a different DNA analyst to perform polymerase chain reaction ("PCR") testing on the sample -- PCR is a technique that is more sensitive and requires a smaller sample than RFLP testing.[45] This practice, which Mr. Bolding applied to compensate for Dr. Sharma's weakness with RFLP analysis, also became widely used by the Crime Lab's DNA analysts when RFLP testing failed to generate suspect inclusions.

In fact, as discussed in detail later in this report, we found several cases in which Crime Lab DNA analysts disregarded RFLP results, which are highly discriminating, in favor of more "sensitive" PCR testing. PCR-based testing is more sensitive than RFLP in that the amplification process enabled analysts using early PCR-based testing systems to detect alleles in samples containing very little DNA or in samples that were degraded.[46] However, the very same amplification process that made early PCR-based testing more sensitive also made it more susceptible to contamination and errors due to poor analyst technique.

We found that, due to a combination of poor technique and possible contamination, Crime Lab analysts often detected an abundance of questionable alleles

---

45 Dr. Sharma was never trained in PCR analysis.

46 Alleles are any number of alternative forms of a gene that occupy a fixed position, or locus, on a chromosome. People typically have two alleles at each locus, although an individual may be homozygous -- meaning having only one allele -- at particular loci.

through PCR testing. In several troubling cases, they interpreted these alleles selectively based on the known reference profiles of suspects. Thus, a practice developed in the Crime Lab of reporting the inclusion of suspects based on sometimes questionable PCR results, while ignoring or calling "inconclusive" RFLP results that failed to develop a suspect's profile on the grounds that RFLP testing is less "sensitive" than PCR testing.[47]

2. Early Problems in the DNA/Serology Section

In mid-1993, Mr. Bolding was promoted to the Criminalist IV position overseeing the Trace Evidence and DNA/Serology Sections as well as CER. Mr. Bolding acknowledges that, despite Dr. Sharma's already apparent weakness as a bench DNA analyst, he supported the decision in 1993 to promote Dr. Sharma to the DNA/Serology Section Criminalist III line supervisor position that Mr. Bolding had just vacated. At the time, Mr. Bolding believed Dr. Sharma was competent and that, as the only scientist with a doctorate degree in the Crime Lab, he was appropriately credentialed for the supervisor position.

The new DNA/Serology Section began experiencing funding, workload, and morale problems within a very short time after DNA analysis began within the Crime Lab.

In a May 12, 1994 memorandum to a lieutenant in the Sex Crimes Unit, Mr. Bolding responded to the lieutenant's request for information regarding the needs of the DNA/Serology Section. In the memorandum, Mr. Bolding stated that the DNA/Serology Section was not funded to do the volume of DNA testing that he would like. In particular, Mr. Bolding explained that, due to "under funding and under staffing," the Crime Lab performed DNA testing only in cases where a comparison could be made to a known sample. Mr. Bolding said that he would prefer the DNA/Serology Section to perform testing to "absolute completion" and to have funding sufficient to build a local felon database "that would fit precisely into the national 'Combined Offender DNA Information System' (C.O.D.I.S.)." Mr. Bolding also anticipated the advent of short tandem repeat ("STR") sequencing analysis, and he reported that the Section was "attempting to acquire all supplies[,] equipment and training required for this next step." The system Mr. Bolding described in 1994, in which the Crime Lab obtained DNA profiles from evidence almost exclusively in cases in which a known suspect reference sample was submitted for comparison, persisted

---

47 Two such cases, discussed in detail later in this report, are those involving defendants Franklin Alix and Garland Davis.

through the early 2000s and, as described below, resulted in an enormous backlog of unprocessed rape kits that were never entered into CODIS for comparison against the offender database.

In August 1994, Dr. Sharma held individual meetings with analysts in the DNA/Serology Section to address developing problems in the Section. Commenting on the Section's system of processing a DNA case -- which involved the DNA extraction performed by a serologist, who then passed the case to an RFLP analyst, who then, if necessary, passed the case to a third analyst for PCR testing -- Mr. Chu stated that he believed "too many chemists are involved in some cases" and that, "[i]n a lot of cases[,] evidence shuffle from one to other we can miss some information [sic]." Dr. Sharma dismissed these concerns and responded that the "evidence is transferred from one serologist to the next according to the SOP" and that Mr. Chu would have to be "more specific about what kind of information we can miss." Unfortunately, as reflected by the Lynn Jones incident two years later, Mr. Chu's observations about the potential for information to become lost and cases to be delayed because of the Section's flawed analytical process would prove prescient.

During these August 1994 meetings, members of the DNA/Serology Section raised concerns about the lack of consistency among analysts in the Section in adhering to the SOPs as well as the lack of specificity in some areas of the SOPs. This lack of specificity in the SOPs, said DNA/Serology analyst Maurita Carrejo in a 1994 memorandum provided to Dr. Sharma, could be used as a "weapon" against line analysts in the Section. Another analyst, Christy Kim, complained about the lack of training, stating that "I need to have a scheduled and more solid training in PCR." In a staff survey conducted by Mr. Bolding in November 1994, members of the DNA/Serology Section complained about "destructive comments," "cultural bias," lack of standardized SOPs, and favoritism.

3. Feuding Between Mr. Bolding and Dr. Sharma

In October 1994, a specific conflict developed between Mr. Bolding and Dr. Sharma over the placement of a new analyst in the DNA/Serology Section. This conflict gave rise to a lengthy and destructive turf battle between Mr. Bolding and Dr. Sharma about the appropriate level of supervision Mr. Bolding should exercise over the Section.

In addition, Dr. Sharma also made a serious error in a serology case in May 1995. While Dr. Sharma was training a new serologist, Mr. Bolding asked Dr. Sharma to determine whether semen was present in a dried fluid stain. Rather than test for the presence of semen using a p30 or acid phosphatase ("AP") test, Dr. Sharma simply viewed the stain, still on the substrate, under a stereo microscope and reported it

negative for the presence of semen.[48] Later, while attempting to remove fibers from the sample for analysis, a trace evidence examiner discovered that no presumptive testing for semen had been performed. Upon learning of the error, Mr. Bolding directed that a chemical test be performed on the sample, and this test indicated positive for the presence of semen.[49] Dr. Sharma received no significant corrective action or remedial training as a result of this error even though it was discovered at the time.[50]

Following the discovery of his error, Dr. Sharma resisted Mr. Bolding's attempts to supervise him and the members of the DNA/Serology Section directly. In mid-1995, Mr. Bolding lowered Dr. Sharma's overall evaluation rating, which led to a prolonged grievance process that extended into early 1996.

On February 22, 1996, Mr. Bolding lodged a formal complaint with IAD against Dr. Sharma, alleging "official repression" and citing numerous incidents of alleged misconduct on the part of Dr. Sharma, some dating as far back as late 1994 and 1995.[51] In June 1996, Dr. Sharma filed a broad set of allegations against Mr. Bolding with IAD, none of which was sustained. The investigator commented that "[t]his IAD investigation is another episode of the on going [sic] problems between Mr. Sharma and Mr. Bolding" and that "Mr. Sharma continues to demonstrate that he is a disgruntled and contentious employee."

In short, the DNA/Serology Section at this time was sinking into bitter internal conflicts between the Section's supervisor and manager, which were obvious to everyone in the Section, if not the entire Crime Lab. Indeed, both Mr. Bolding and Dr. Sharma acknowledge that they were in frequent conflict with each other during this period. Yet, these corrosive internal battles were allowed to continue, and they had an adverse impact on the proper functioning of the work in the Section.

---

48 p30 is a protein present in seminal fluid. Acid phosphatase is an enzyme that is secreted by the prostate gland into seminal fluid.

49 By the time Dr. Sharma's error was discovered, the Assistant District Attorney involved in the case already had agreed to a lesser-charge plea bargain based on Dr. Sharma's original assessment that no sperm was present in the sample.

50 Mr. Bolding included this incident in the February 22, 1996 IAD complaint he filed against Dr. Sharma. The IAD investigator found that the incident already had been resolved through an informal procedure known as PPI (an acronym for "policy, procedures and issues") and considered the matter closed.

51 After an completing its investigation of Mr. Bolding's charges against Dr. Sharma, IAD determined the allegations to be "not sustained."

On August 28, 1996, Mr. Krueger finally removed Dr. Sharma as the Criminalist III in the DNA/Serology Section and placed him in a newly created QA/QC position. Mr. Krueger told us that he took this action in response to the difficulties Dr. Sharma was having with Mr. Bolding and others in the DNA/Serology Section. Essentially, Mr. Krueger's strategy for dealing with Dr. Sharma's disruptive presence in the Section was to isolate Dr. Sharma in a position in which he did not directly supervise anyone and reported directly to Mr. Krueger.[52] However, this measure was one of expediency in terms of managing personality conflicts within the Crime Lab. Because of Dr. Sharma's laziness and lack of professionalism, he was extremely unlikely to succeed in establishing an effective QA/QC program for the Crime Lab. As discussed later in this report, Dr. Sharma was not effective in the QA/QC position, and he made little progress toward the goal of accreditation, which was never pursued in an aggressive or sustained manner under Mr. Krueger's leadership.

Because Dr. Sharma retained the only Criminalist III position allocated to the DNA/Serology Section despite his removal as its line supervisor, no one replaced Dr. Sharma as the Criminalist III supervisor for the Section. Although the Criminalist III vacancy appeared on the Crime Lab's organization chart, it was never filled, and the absence of a competent technical supervisor remained a gaping hole in the management structure of the DNA/Serology Section for six years, through December 2002, when the Crime Lab's DNA analysis function was suspended.

4. The Lynn Jones Case and the 1996 Inspections Division Audit of the DNA/Serology Section

On January 26, 1996, Lynn Jones was arrested and charged with sexual assault of a child. A rape kit was completed and investigators gathered evidence in the form of sheets, bedding, and clothing from the alleged crime scene. On February 1, 1996, the District Attorney's office requested that the Crime Lab process the rape kit, and an initial examination of the kit was performed on February 12, 1996. On March 20, 1996, hair, blood, and saliva samples were collected from Mr. Jones, who remained in custody. The Crime Lab case number for Mr. Jones's case was handwritten on a stenographer's notepad, which at that time constituted the sole log and tracking system

---

52 Many witnesses recalled that the removal of Dr. Sharma as the supervisor in the DNA/Serology Section was a consequence of the Lynn Jones matter, discussed below, which came to light in October 1996. However, the date of Mr. Krueger's memorandum, which preceded the media reports that first informed him of the Lynn Jones case, together with his recollection that the action was taken to relieve infighting and consternation in the DNA/Serology Section, appear to establish that the timing of the Dr. Sharma's removal and the publicity about the Lynn Jones case was coincidental.

for cases requiring DNA analysis. Over three months later, on July 2, 1996, the serologist responsible for extracting DNA samples transferred the case to an RFLP analyst and told the DNA analyst that the case was "extremely urgent." Because the RFLP analyst had difficulty obtaining results from the extracts, the analyst requested that PCR testing be performed. On September 23, 1996, the case was transferred to a third analyst in the DNA/Serology Section for PCR testing.

On October 9, 1996, a television news story ran on Mr. Jones's case, and, on October 11, 1996, the *Houston Chronicle* reported that he had been jailed on a sexual assault charge for nearly nine months while awaiting the Crime Lab's completion of the DNA tests that eventually cleared him and resulted in his release. An IAD investigation was immediately opened, and Dr. Sharma was cited for incompetence in connection with his failure to properly manage the DNA/Serology Section's case assignments and for modifying Crime Lab procedures without prior review and authorization.[53] On April 23, 1997, Dr. Sharma was punished with a five-day suspension.

In the immediate wake of the debacle surrounding the Jones case, on or about October 15, 1996, HPD Chief Nuchia directed the Department's Inspections Division to audit the DNA/Serology Section's procedures for receiving evidence requiring DNA analysis and for assigning, tracking, and managing DNA cases. The following month, the Inspections Division issued a detailed report containing the following four findings:

- The Crime Lab had no system to ensure that requests for DNA analysis contained in HPD officers' offense report supplements were received by analysts.
- The offense report supplements used to request Crime Lab analysis did not provide sufficient information to allow for the assignment of priorities to requests for analysis or to determine the level of analysis that would be required.
- Case files maintained by the Crime Lab did not contain timeline data necessary for case management.
- The Crime Lab lacked management oversight with respect to the assignment, transfer, monitoring, and tracking of cases, and cases were assigned on an *ad hoc* or crisis basis.

---

53 IAD also concluded that Dr. Sharma had not been truthful with investigators.

The report concluded that, "[a]lthough the DNA/Serology Unit diligently strives to complete as many DNA requests as possible, a comprehensive case management system is needed to provide resource accountability and guidance toward prioritizing the cases worked."

The 1996 Inspections Division Audit Report also encouraged HPD to purchase equipment necessary to bring STR testing on-line in order to reduce the time necessary to complete DNA analyses. The report anticipated that the CODIS offender database would be made available on the state level in the near future and predicted that:

> The DNA/Serology Unit workload will be *significantly increased* due to the fact that all sexual assault kits will require testing and DNA data entry into the CODIS database. If the Crime Lab is to contribute to the CODIS system, the ability to rapidly turnaround [sic] DNA sample testing through the use of STR-PCR testing *is mandatory*. [Emphasis in original.]

As anticipated by the 1996 Audit Report, the backlog of rape kits that the Crime Lab failed to process and enter into CODIS swelled in the late 1990s and early 2000s to approximately 19,500 unanalyzed kits as of mid-2002. Indeed, between 1998 and the end of 2002, the Crime Lab entered fewer than 350 profiles into CODIS.

5. DNA/Serology Section Criminalists Raise Concerns Regarding the Absence of a Line Supervisor

After Mr. Krueger removed Dr. Sharma as the line supervisor for the DNA/Serology Section in late August 1996, management of the Crime Lab failed to fully appreciate the Section's critical need for competent supervision and technical leadership and to communicate the urgency of this need up the HPD chain of command. Although, as discussed below, the Crime Lab's DNA analysts repeatedly voiced their concerns about the lack of a Criminalist III supervisor in their Section, Mr. Krueger told us that he believed Mr. Bolding was capable, both technically and operationally, of supervising the Lab's DNA work. While Mr. Krueger sympathized with the DNA analysts in their desire for a Criminalist III supervisor, filling that position did not have the same priority for him as, for example, obtaining additional resources for processing the large volume of controlled substances cases submitted to the Crime Lab.

On February 9, 1997, Chief Bradford convened a meeting attended by, among others, Assistant Chief Simmons, Mr. Krueger, Mr. Bolding, and a representative from HPD's Budget and Finance Division to discuss the recommendations contained in the

1996 Inspections Division Audit Report.[54] Rather than take this opportunity to raise the need for a replacement line supervisor with command staff in the presence of budget personnel, Messrs. Krueger and Bolding reported that "case management problems will be eliminated" because "the Crime Lab has instituted procedures and installed a new supervisor over the DNA Testing Section." The "new supervisor" referenced in the minutes was Mr. Bolding himself, who was a "new supervisor" only in the sense that the intermediate level supervisor, Dr. Sharma, had been transferred. Mr. Bolding had never been a bench DNA analyst and, as a Criminalist IV, had administrative responsibility over both the Trace Evidence and DNA/Serology Sections, as well as CER.[55]

In his interviews with us, Mr. Bolding said that he was acutely aware of the problems associated with the absence of a line supervisor and that he believed, in part for that reason, that the DNA/Serology Section was in troubled waters from at least that point forward. However, the documentary record fails to demonstrate that Mr. Bolding's claimed recognition of the problems created by the lack of a line supervisor over the DNA/Serology Section translated into sustained advocacy for filling the Criminalist III vacancy. Chief Bradford told us that he was unaware, as of the time of this February 1997 meeting, of the supervisory gap in the DNA/Serology Section.

The Crime Lab's budget submissions in the late 1990s also failed to make the case for filling the Criminalist III vacancy. For example, the Crime Lab's budget submission for fiscal year 1998, dated January 14, 1997, stated that the Lab's DNA/Serology and Toxicology Sections were without "the direct line supervision of a Criminalist III" and rather meekly suggested that the "[c]reation of the two Criminalist III positions will complete the laboratory's organizational structure by providing the needed direct line supervision for all sections." This budget document contains no explanation of the potential problems that would arise -- and indeed had already arisen -- as a result of the absence of adequate and competent supervision in the DNA/Serology Section. The

---

54 Chief Bradford advised us that, well before this meeting, when he became Interim Chief of Police in November 1996, and then Chief of Police in December 1996, he was aware of the issues raised in the Inspections Division Audit Report.

55 Mr. Krueger told us that he believed Mr. Bolding's involvement with trace evidence was "extremely limited" and that Mr. Bolding did not perform technical reviews of trace evidence cases. Mr. Krueger recalled that, to the extent the Crime Lab's trace evidence examiner had technical issues in her work, her would consult with her about them. However, no one, including Mr. Krueger, performed formal technical reviews of the Crime Lab's trace evidence cases. Mr. Bolding supervised CER from 1994 through 1997.

Crime Lab's fiscal year 1999 budget submission contained no reference at all to the DNA/Serology Section supervisor vacancy.

On September 14, 1999, a group of six Criminalist I and II bench analysts in the DNA/Serology Section signed a memorandum addressed to Chief Bradford entitled "Restoration of Criminalist III Position to Serology/DNA Section." This memorandum described the period between 1993 and 1996, when Dr. Sharma was the line supervisor of the DNA/Serology Section, as a "total disaster" due to Dr. Sharma's "mismanagement" of the Section. The memorandum stated that "it is critical" that the DNA/Serology Section supervisor position, which had remained vacant since Dr. Sharma's removal from the position three years earlier, "be restored and occupied by one of the most qualified Criminalists in the section."

On October 20, 1999, a group of line analysts from the DNA/Serology Section met with Chief Bradford to discuss their request that the position of Criminalist III in the DNA/Serology Section be restored, as well as other issues related to equipment and training for the Section.[56]

It is unclear whether Chief Bradford received and read the September 14, 1999 memorandum before, during, or after the October 20, 1999 meeting. The analysts did not send the memorandum through the normal chain of command, which would have consisted of Mr. Krueger, Assistant Chief Milton Simmons, and Executive Assistant Chief Storemski. We were told that HPD procedures require that each official who receives a piece of correspondence sign his name to reflect his review of the document. Neither Assistant Chief Simmons nor Executive Assistant Chief Storemski signed the document, and both of them deny that they saw the document in 1999.

Chief Bradford denied seeing the memorandum at or around the time of the meeting, and he advised us that, when the memorandum came to light in 2003, he and his staff conducted an exhaustive search for the memorandum but failed to locate it. Chief Bradford said that, in particular, he did not recall being informed, either in writing or orally, of the pressing need for a first-level supervisor in the DNA/Serology Section. He further told us that, had he been aware of the urgent need for a DNA supervisor, he would have taken action to fill the gap. By contrast, more than one of the DNA/Serology Section analysts specifically recalls that the memorandum was

---

56 Although Mr. Krueger recalled the DNA analysts preparing a letter for Chief Bradford, he told us that he was not aware, at the time, of their meeting with the Chief. Mr. Krueger said that he was hurt and upset that the DNA criminalists were going up the chain of command with their issues because he felt it reflected their view that he had not been advocating forcefully for them. Mr. Krueger recalled feeling that this was a stinging reproach to his leadership.

provided to Chief Bradford at the outset of the meeting and that he was holding it during the meeting. Whether or not Chief Bradford received the memorandum, the notes of the meeting, taken by a member of Chief Bradford's staff, reflect that the need for a Criminalist III supervisor was the first issue discussed. The notes state: "(1) QAQC slot available. Additional Criminalist III position needed in Crime Lab."[57]

Regardless of whether Chief Bradford saw the September 14, 1999 memorandum, accounts from numerous people whom we interviewed and who were present at the October 20, 1999 meeting described an extremely positive response from Chief Bradford. Indeed, the criminalists were euphoric after the meeting. They immediately convened a meeting with other personnel in the Crime Lab to report the positive reception from Chief Bradford, which they believed boded well for positive action on their requests. Building on their perceived success in getting Chief Bradford's attention, two criminalists had a second meeting with him in late December 1999.

The criminalists' optimism was short-lived. In an undated memorandum, apparently issued after the second meeting, Chief Bradford responded that the "Criminalist III position has been put on hold until sufficient funding is acquired. Funds may be converted if future vacancies within Criminalist I or II classifications occur." This memorandum from Chief Bradford effectively sentenced the DNA/Serology Section to continue functioning without a supervisor for the indefinite future. We were told that the members of the DNA/Serology Section were devastated by this response. After receiving the Chief's memorandum, Mr. Bolding, in particular, felt that the DNA/Serology Section's "ship had sunk" and that major problems in the Section at that point were inevitable. Chief Bradford told us that he was not aware of the impact his memorandum had on Crime Lab personnel.

Thus, as DNA analysis grew in importance as a forensic technique in the mid- and late-1990s, the DNA/Serology Section was the only section in the Crime Lab without a Criminalist III line supervisor. This result was dictated by several factors, including the lack of funding once the QA/QC position was created for Dr. Sharma; the failure of Crime Lab management to effectively emphasize that the extended gap in supervision was bound to create a crisis for the quality of the work being performed in the DNA/Serology Section and to forcefully make the case up the chain of command for filling the position; and the failure of the chain of command to recognize the specific

---

57 Chief Bradford, on review of the notes, took issue with whether he was made aware that it was a *DNA* supervisor specifically that the analysts said was needed. However, all of the analysts who attended the meeting with Chief Bradford were from the DNA/Serology Section, and it is difficult to imagine that they failed to convey that it was their Section that needed a supervisor.

importance of providing the DNA/Serology Section with a line supervisor, as well as providing the Crime Lab generally with more resources.

Based on our DNA case reviews, it is clear that Mr. Bolding was not a competent technical leader for DNA analysis. Meanwhile, under his leadership, the Crime Lab's DNA analysts -- who were never adequately trained and who were not receiving competent technical guidance -- continued processing and reporting cases while using and perpetuating the flawed practices that we found permeated virtually the entire body of the Crime Lab's DNA work during the 1990s and early 2000s.

6. Absence of Internal Quality Control Reviews in the DNA/Serology Section

Section 300/2.07 of the Crime Lab's SOPs, in effect from November 30, 1992 until after the DNA Section was closed in December 2002, provided that "[e]ach section of the Crime Laboratory Division will be inspected in November of each year" and that these inspections will be conducted by the assistant Lab director and the Criminalists IV and Criminalists III assigned to each section. During the course of IAD's investigation into issues related to the Crime Lab, both Mr. Krueger and Mr. Bolding acknowledged that compliance with the inspection requirements of the SOPs had lapsed in the late 1990s.

In fact, the last inspection performed pursuant to the SOPs was conducted between December 2, 1996 and January 14, 1997 and involved the review of a sample of cases analyzed in 1995. Mr. Bolding's review of DNA/Serology Section cases focused entirely on issues related to the organization and completeness of the documentation contained in the case files, and did not address technical issues related to DNA analysis and the reporting of DNA results. The March 21, 1997 Property and Documentation Inspection Report related to this review does not reflect that issues such as Crime Lab conditions, equipment, or analyst training and qualification were addressed at all. After 1997, even these inspections stopped.

The CODIS program in Texas went into effect on January 1, 1996. In June 1998, Mr. Bolding submitted formal documentation to enable the Crime Lab to participate in the CODIS program. Among the federal requirements for crime laboratories participating in CODIS are that DNA profiles entered into CODIS must have been analyzed by qualified personnel, internal audits of the laboratory must be completed each year, and the laboratory must be audited by an outside agency every other year. These conditions are to ensure that the database is not corrupted by inaccurate or incomplete information.

The first time that the DNA/Serology Section was ever audited by an outside agency was in December 2002 when a DPS audit led by Ms. Rios resulted in the suspension of DNA analysis by the Crime Lab. Mr. Bolding, however, earlier performed two quality assurance audits of the DNA/Serology Section, using the Quality Assurance Standards for Forensic DNA Testing Laboratories and Convicted Offender DNA Databasing Laboratories issued by the FBI in October 2000.[58] The first of these audits was completed in December 2000 or January 2001.[59] The second is dated September 2001.

Neither of Mr. Bolding's audits of the DNA/Serology Section reflects the widespread and serious deficiencies found by the outside team that performed the December 2002 audit and that resulted in the closure of the DNA/Serology Section. For example, in Mr. Bolding's 2000 audit, he filled out the audit form to indicate that the technical leader of the DNA/Serology Section -- i.e., Mr. Bolding -- possessed all of the educational requirements necessary under the standards, including coursework in statistics. In 2001, Mr. Bolding left this area blank, but checked "no" next to the question asking whether the technical leader possessed minimum coursework in statistics. The DPS audit in 2002 found that Mr. Bolding did not -- at any time -- satisfy the educational requirements for technical leaders. Mr. Bolding also rated the Crime Lab as having satisfied FBI standards relating to procedures for preparing case notes and the Section's lab reports as containing all required information. Among other problems it identified, the 2002 DPS audit found that no such written procedures existed and identified numerous deficiencies in the documentation contained in the Crime Lab's reports. Mr. Bolding also found in 2001 that managerial staff of the DNA/Serology Section had been "provided the resources needed to discharge their duties and meet the requirements of the [FBI] standards."[60] The 2002 DPS audit team found to the contrary. Moreover, Mr. Bolding's statement in 2001 contradicts his assertion to us that, after Chief Bradford denied the DNA/Serology Section analysts' direct request for a Criminalist III supervisor, he believed the Section's "ship was sunk."

---

58 The standards Mr. Bolding used in his two internal audits were the same quality assurance standards used by Ms. Rios's team of auditors from DPS and the Tarrant County Medical Examiner's Office in December 2002.

59 The first audit is stamped with the date "Sep 00," which is inconsistent with the date the FBI standards were issued in October 2000. Mr. Bolding explained to IAD that he began the audit in September 2000 using a prior version of the FBI standards, was called away by other tasks, and eventually completed the audit in December 2000 or January 2001.

60 Mr. Bolding submitted his 2001 quality assurance audit to the DPS CODIS laboratory in Austin, Texas.

In a January 18, 2000 memorandum to Chief Bradford, Mr. Krueger requested that the educational requirements for the criminalist positions be modified to conform to the FBI's "mandated minimum qualifications for those personnel who perform DNA analysis." Mr. Krueger reported to Chief Bradford that the "laboratory's current DNA personnel either already meet the guidelines or will have the additional educational requirements in the near future."[61] In his 2000 and 2001 quality assurance audits, Mr. Bolding found that Crime Lab personnel have the "education, training and experience commensurate with the examination and testimony" they provide. In December 2002, the DPS audit team again found to the contrary.

V. The Crime Lab's Problems Become Public (2001–2004)

The many and severe problems plaguing the Crime Lab came to the attention of the public in September 2001 when Channel 13 reported that only approximately 25% of sexual assault kits submitted to the Lab were actually analyzed. In May 2002, Jennifer LaCoss, an analyst in the DNA/Serology Section, resigned, citing numerous problems concerning the resources afforded the Crime Lab. By the end of 2002, following an investigative series aired by KHOU-Channel 11, serious questions regarding the work performed by the Crime Lab, and the DNA/Serology Section in particular, would lead HPD to commission an outside audit of the Section. Almost immediately after the two-day December 2002 audit, DNA analysis at the Crime Lab was suspended. Since then, one defendant convicted in part on the basis of DNA testing performed by the Crime Lab, Josiah Sutton, was released from prison and pardoned.[62] In the aftermath of the closure of the DNA/Serology Section, HPD and the Crime Lab were plagued by a steady stream of negative press reports questioning the integrity of work performed by virtually every section of the Lab.

A. Sexual Assault Kit Backlog

In September 2001, local Houston Channel 13 reported that the Crime Lab analyzed only approximately 25% of sexual assault kits received by HPD and that the only kits that were tested were those for which there was a known suspect.[63] During a

---

61 Chief Bradford states that assurances similar to this one from Mr. Krueger, together with certifications provided to him in connection with various DNA-related grant applications, led him to believe that the Crime Lab's DNA program was on track.

62 A detailed discussion of the Crime Lab's work in the Sutton case appears later in this report.

63 This news report accurately reflected the DNA/Serology Section's practice for processing rape kits that had been in place since the early 1990s. Indeed, the practice of only performing typing work on cases in which known reference samples had been submitted predated the DNA/Serology Section and is reflected in the Crime Lab's serology work.

City Council "pop off" session on September 19, 2001, then-Council Member Annise Parker stated that she was disturbed by the report and concerned that a powerful tool for the identification of sex offenders was not being used. Ms. Parker suggested that the City should find sufficient funds to provide the Crime Lab with the personnel and supplies necessary to process both backlogged and incoming sexual assault kits.

In response to Ms. Parker's comments, on September 20, 2001, Executive Assistant Chief Storemski directed Mr. Krueger to estimate the funding and personnel that the Crime Lab would require in order to process all incoming sexual assault kits. On September 26, 2001, Mr. Krueger responded that the DNA/Serology Section would require, at a minimum, ten additional criminalists, including one Criminalist III and three Criminalists II, as well as additional supplies to process 100% of the incoming sexual assault kits, at a total cost of approximately $525,000. In March 2002, Mr. Bolding estimated that there were 19,500 sexual assault kits received by HPD that had never been processed, some dating as far back as 1980.[64]

In response to the sexual assault kit issue, the City Council allocated $600,000 to reduce the Crime Lab's backlog of DNA cases. In a memorandum to Chief Bradford dated June 25, 2002, Executive Assistant Chief Storemski -- after consulting with Assistant Chief Simmons, Mr. Krueger, and other personnel from the Crime Lab -- recommended that approximately half of these funds be devoted to hiring four new criminalists for the DNA/Serology Section (including a Criminalist III supervisor) and purchasing supplies for the Crime Lab, while the other half of the money be used to outsource rape kits to other laboratories. Chief Bradford rejected this recommendation, responding: "We can not hire new personnel. This is a 'one time' pool of money." According to a memorandum dated July 11, 2002, the ultimate decision was to devote $135,000 of the City Council allocation to overtime compensation for existing analysts to work on rape kits, $65,000 to supplies for the Crime Lab, and $400,000 to outside laboratory analysis of kits. This solution did not address the prolonged technical, supervisory, and resource limitations that contributed to the massive backlog in unanalyzed rape kits in the first place.

DNA analyses of sexual assault kits involving unknown suspects, and the loading of the results of these analyses into CODIS, are very significant issues. Because the Crime Lab only recently has been authorized to begin entering DNA profiles into

---

64 In a letter to Council Member Shelley Sekula-Gibbs, M.D. dated May 22, 2002, Chief Bradford stated that "current estimates indicate that there are 7200 sexual assault cases dating back to 1992 with usable DNA evidence at HPD which have not been processed."

CODIS, HPD for the past four years has been outsourcing those "cold case" rape kits to other laboratories.

B. The Resignation of Jennifer LaCoss

Jennifer LaCoss joined the DNA/Serology Section as a Criminalist I in December 2000. A year and a half later, in May 2002, she resigned from the Crime Lab. In a letter dated May 28, 2002, Ms. LaCoss cited the following reasons for her decision to leave the Crime Lab:

- "Horrendous" working conditions, including, in particular, the roof leaks that created safety hazards and allowed water to come into contact with "biological materials such as blood soaked items" and "compromise[ ] the integrity of biological evidence."

- "Dismal" salaries that were "50 percent lower than the national average for criminalists, particularly DNA Analysts." Ms. LaCoss found it "disturbing that full-time employees must hold extra jobs just to support their families" and was frustrated that there was "virtually no opportunity for promotion, step increases, or merit raises."

- The "appalling" lack of support for the Crime Lab shown by HPD and the City. Ms. LaCoss wrote that the Lab was "<u>severely</u> under-staffed and under-funded" and that analysts could not possibly keep up with the "<u>huge</u> backlog" of cases. (Emphasis in original.) Ms. LaCoss said that, under the current conditions, the Crime Lab had "no hope" of becoming accredited, which would jeopardize the Lab's ability to continue to receive the federal grants upon which it had come to rely.

- Finally, Ms. LaCoss lamented the unrealized potential of the Crime Lab in light of the fact that "suspectless cases are rarely analyzed due to the desperate staffing and funding situation." As a result, DNA analysts were unable to process "no suspect" or "cold" cases in order to add them to the CODIS database.

On June 4, 2002, Assistant Chief Simmons forwarded Ms. LaCoss's resignation letter to Chief Bradford. In a cover memorandum, Chief Simmons outlined Ms. LaCoss's concerns and added that the Crime Lab's need for additional personnel and supplies had been "thoroughly documented." Chief Bradford asked Assistant Chief Simmons to develop an action plan to address the issues raised by Ms. LaCoss.

Assistant Chief Simmons responded with a one-page memorandum dated July 1, 2002, in which he reported that "[t]he Building Services Department is working quickly to have the roof of the 1200 Travis Building repaired" and that the "DNA backlog is being addressed with the $600,000 granted by council and the anticipated NIJ grant." The memorandum then closed with a plea that [a]dditional personnel are still needed for analysis of Controlled Substances evidence." Even though Mr. Krueger told us that he believed Ms. LaCoss's letter was "dead on" and that he told Chief Simmons so, this memorandum indicated that the issues Ms. LaCoss raised with respect to DNA analysis had already been addressed, and, to the extent it identified any persisting resource issues for the Crime Lab, those issues were in the area of drug analysis. Chief Bradford told us that he considered the response from Assistant Chief Simmons totally inadequate.[65]

Ms. LaCoss also addressed her concerns about the Crime Lab to the Houston City Council during a "pop off" session where she spoke about conditions in the Lab and the backlog of sexual assault kits that the Lab had been unable to process. In the summer of 2002, Council Member Carol Alvarado toured the Crime Lab.

C. KHOU-Channel 11 News Reports Regarding the DNA Analysis by the Crime Lab

The events that quickly led to the closure of the DNA/Serology Section in December 2002 were triggered by a series of investigative reports aired by KHOU-Channel 11 beginning on November 11, 2001. These reports referred to seven DNA or serology cases in which Crime Lab analysts allegedly made analytical errors or misrepresented their findings. KHOU-Channel 11 consulted with two outside experts, Professor William Thompson and Dr. Elizabeth Johnson, who reviewed these cases.

Among the problems found by Professor Thompson and Dr. Johnson in their review of the seven cases were deficient documentation of procedures and results; mistakes in performing analyses of samples containing mixtures of more than one person's DNA; errors in calculating statistical probabilities, particularly in mixture profiles; and mischaracterization of DNA results in testimony.[66] As discussed below in the section detailing the results of our review of the Crime Lab's historical DNA cases,

---

65 Chief Bradford signed Assistant Chief Simmons's memorandum with the notation "Reviewed!" According to Chief Bradford, that notation signified his dissatisfaction with the memorandum, which would have been well understood by other members of the HPD command staff.

66 We interviewed both Professor Thompson and Dr. Johnson more than once, and we appreciate their cooperation in providing us with their perspectives and views with respect to the work historically performed by the Crime Lab.

we found these problems -- as well as others -- were prevalent in the Crime Lab's DNA work during the 1990s and early 2000s.

On November 14, 2002, Mr. Krueger sent a memorandum to Acting Chief of Police T. N. Oettmeier entitled "Statement Concerning DNA Cases and Synopsis of Cases," which summarized the Crime Lab's response to the criticism of each of the seven cases presented in the KHOU reports.[67] Mr. Krueger told us that he prepared the memorandum and asked Mr. Bolding to proofread it. This memorandum included the prefatory statement that "[i]t should be noted that the protocols used by our crime laboratory DNA section conform to the guidelines and protocols developed by the U.S. Department of Justice Federal Bureau of Investigation and the Technical Working Groups for DNA Analysis (TWIGDAM)." Mr. Krueger also reported that he had "confidence in the quality of the work conducted by the DNA section of the Crime Laboratory." Mr. Krueger told us that his bases for these statements were representations made by Mr. Bolding, which he said he believed at the time.[68]

D. December 2002 Audit of the DNA/Serology Section

On November 15, 2002, Mr. Krueger wrote to Ron Urbanovsky, director of the DPS Crime Laboratory System based in Austin, Texas, confirming his oral request that DPS assemble an "independent team, comprised of several individuals from different agencies, to perform a technical in-depth review of [the Crime Lab's] DNA casework." On December 12 and 13, 2002, a three-member team led by Irma Rios, then the head of DPS's DNA laboratory, performed an audit of the DNA/Serology Section based on the same FBI quality assurance standards that Mr. Bolding used in his 2000 and 2001 internal reviews of the Section.

The DPS audit found widespread deficiencies related to virtually every area covered by the FBI standards, including the lack of an established quality assurance and internal auditing system, inadequate resources, a technical leader with inadequate qualifications, an inadequate training program for DNA analysts, insufficient

---

67 At the time of the KHOU-Channel 11 reports and the 2002 DPS audit of the DNA/Serology Section, Chief Bradford was on administrative leave pending his prosecution for perjury -- charges for which he was ultimately acquitted -- and Mayor Lee Brown had appointed Executive Assistant Chief Oettmeier to be Acting Chief of Police.

68 Even though at the time he prepared this memorandum Mr. Krueger still believed Mr. Bolding's representations that the DNA work performed in the Crime Lab conformed with principles and practices generally accepted in the field, Mr. Krueger advised Chief Oettmeier that he had requested "an independent audit of the DNA section" to "verify that all proper protocols are being followed and explore any possible areas of improvement that may exist."

educational backgrounds for analysts, inadequate SOPs, and poor documentation in case files. Ms. Rios told us that the DNA/Serology Section at that time was in the worst shape of any laboratory she had ever inspected, an adverse conclusion she shared, in only a slightly different form, when she testified before the Texas State legislature on March 3, 2003.[69]

On December 13, 2002, the audit team briefed Mr. Krueger on its findings. Mr. Krueger recalled that the audit team told him the DNA/Serology Section was in shambles. He told us that he was completely surprised by this report and that he had expected the audit to exonerate the Crime Lab. On December 13, 2002, Mr. Krueger prepared a memorandum to Assistant Chief Simmons summarizing what the audit team had told him during the briefing, and he met with Assistant Chief Simmons that day. Mr. Krueger recalled that Mr. Bolding refused to attend this meeting with Assistant Chief Simmons and that after the audit Mr. Bolding seemed to "disappear." The results of the audit were then communicated to Acting Chief of Police Oettmeier probably the next day. The DNA/Serology Section was closed almost immediately thereafter.

Despite his initial shock upon learning of the DPS team's audit findings, it appears that Mr. Krueger remained in denial about the abysmal state of the Crime Lab's DNA operations. On January 9, 2003, Mr. Krueger prepared a memorandum addressed to Assistant Chief Simmons entitled "Reassessment of DNA Audit." In this memorandum, Mr. Krueger reported that "[t]he final audit report as received was not nearly as critical in content as I had thought it might be. Despite the appearance of monumental problems the primary deficiencies concern documentation." Despite having made this statement, it was clear to us that Mr. Krueger -- who was not trained in DNA -- did not grasp the seriousness and the extent of the problems with the Crime Lab's DNA analysis and reporting. For example, it was not until our in-person meeting with Mr. Krueger in June 2006 that he came to understand the problems with the Crime Lab's misleading practice of reporting of statistics in mixture cases based on the suspect's reference sample, which greatly exaggerated the strength of the association between the suspect and the evidence indicated by the Lab's DNA results in many cases, including the Sutton case.[70]

---

69 At the time of the DPS audit, the DNA/Serology Section, unlike the other crime laboratories Ms. Rios had previously inspected, had not been accredited or undergone preparations in anticipation of the inspection.

70 The Crime Lab's practice of misreporting frequency estimates in DNA cases is discussed in detail in the section of this report addressing the Crime Lab's historical DNA work.

E. The Sutton Case

The next jolt to the reputation of the Crime Lab came with revelations about the DNA/Serology Section's work in the Josiah Sutton case. In 1999, Mr. Sutton was convicted by a jury of aggravated kidnapping and aggravated sexual assault in connection with an October 1998 rape. Christy Kim had performed DNA testing in this case, and she testified at trial that, using PCR-based testing, she had detected Mr. Sutton's "DNA pattern" in various items of evidence, including a vaginal swab taken from the victim. From the time of his arrest, Mr. Sutton and his family always maintained his innocence. After viewing the November 2002 KHOU news reports that questioned DNA and serology work performed by the Crime Lab, Mr. Sutton's mother contacted KHOU and asked the reporters to look into her son's case. The reporters contacted Professor Thompson to request that he review Ms. Kim's DNA analysis in the Sutton case. During a report that aired on KHOU in January 2003, Professor Thompson described the Sutton case as a clear miscarriage of justice.

That month, HPD requested that an outside laboratory review the Crime Lab's case file for the Sutton matter. On January 31, 2003, the outside laboratory reported that the Crime Lab's results in this case "are incorrect " and strongly recommended that the evidence in the case be "re-analyzed using the more powerful STR DNA analysis methods due to the variety of problems" the laboratory observed in Ms. Kim's DNA analysis and the reporting of her PCR results. On February 3, 2003, Mr. Krueger forwarded the results of the outside laboratory's review of the Sutton case to Executive Assistant Chief Storemski and Assistant Chief Simmons and reported that "[s]amples from the case will be sent out for reanalysis using the new STR procedures." On March 10, 2003, an outside laboratory reported that Mr. Sutton was excluded as a contributor to the DNA evidence obtained from the victim's vaginal smear, directly contradicting the DNA results reported by Ms. Kim in 1999.[71]

F. Mr. Kruger's Resignation from the Crime Lab

Mr. Krueger resigned from the Crime Lab on February 21, 2003.[72] Chief Bradford had been on administrative leave from HPD pending resolution of the perjury charges brought against him by the District Attorney's Office. On or about January 23, 2003, Chief Bradford was acquitted by a directed verdict entered by the judge presiding over

---

71 Mr. Sutton was released from the Harris County jail on March 12, 2003. He was pardoned by Texas Governor Rick Perry over a year later, on May 14, 2004.

72 Following Mr. Krueger's resignation, Mr. Bobzean functioned as the acting director of the Crime Lab.

his trial. Mr. Krueger told us that Chief Bradford's acquittal was a determining factor in his decision to resign as the director of the Crime Lab. Mr. Krueger believed that Chief Bradford would blame him for the DNA-related scandals that overwhelmed the Crime Lab during the preceding three months. Mr. Krueger also admitted that he was "falling apart" emotionally as a result of the DNA scandal.

The KHOU reports, followed closely by the exoneration of Mr. Sutton, left the Crime Lab in virtual chaos, and there was significant concern that the case of Mr. Sutton would only be the first of many cases involving wrongful convictions related to work performed by the Lab. In March 2003, out of concern for other possible wrongful convictions, HPD and the District Attorney's office initiated a post-conviction DNA re-testing program that is still continuing.[73]

G. Investigations of the Crime Lab

On December 16, 2002, after the DPS audit of the DNA/Serology Section had been completed and the decision to close the Section had been made, the first of what was to become many Crime Lab-related IAD investigations began. In all, after December 2002, HPD conducted more than 25 internal investigations related to the Crime Lab. Many of these investigations were quite intensive, involving multiple rounds of interviews and witness statements. As the interim Crime Lab director, Mr. Fitzpatrick, observed, these investigations, coupled with the persistent negative press coverage regarding the Lab in the Houston broadcast and print media, contributed to a period of extremely low morale for Lab staff.

On or about April 9, 2003, the 22 Harris County criminal district judges called for a grand jury investigation to be opened with respect to potential criminal conduct within the Crime Lab. Later that day, the Harris County District Attorney announced he had already been investigating the Crime Lab for several weeks. In mid-May 2003, a second grand jury, apparently operating independently of the District Attorney's Office, also began investigating the Crime Lab. In October 2003, this second grand jury concluded its investigation without issuing any indictments. No indictments were ever issued from the first grand jury either.

IAD investigations concerning the conduct of Crime Lab personnel continued during our investigation. Our Fourth and Fifth Reports, issued in December 2005 and

---

73 The DNA re-testing program is discussed later in this report. HPD and the District Attorney's Office have identified 415 cases for re-testing by outside laboratories. As of May 5, 2007 -- more than four years after the re-testing program started -- re-testing in 59 of those cases still had not been concluded.

May 2006, respectively, disclosed serious problems that we observed in the Crime Lab's historical DNA cases. Three analysts who had worked in the Crime Lab's DNA/Serology Section and had performed DNA analysis in certain major issue DNA cases discussed in our reports still were employed in the Lab. In response to our reports, HPD opened IAD investigations into the three analysts' conduct and performance in those major issue cases. We cooperated with HPD's requests for information in connection with these IAD investigations, and we made clear our view that the problems discussed in our reports, as far as the work performed by these three analysts was concerned, were related to systemic deficiencies that existed in the Crime Lab at the time the cases were analyzed and were not the product of individual misconduct.[74] These IAD investigations contributed to the anxiety that many Crime Lab employees felt regarding our investigation, which we found to be unfortunate.[75]

VI. Transitions in the Crime Lab and the Move Toward Accreditation

In the wake of the scandals of late 2002 and early 2003, which centered on the Crime Lab's DNA analysis, the Lab underwent a prolonged period of upheaval from which, in many ways, it is still emerging. Under a new Chief of Police and a new Crime Lab director, HPD has devoted substantial attention to reforming the Lab, including by taking the significant step of obtaining ASCLD/LAB accreditation across most of the areas in which the Lab performs forensic analysis.

A. Early Consideration of Accreditation

ASCLD/LAB was incorporated in 1988. Although it is frequently confused with ASCLD (the American Society of Crime Lab Directors), ASCLD/LAB is a distinct organization with a specific mission -- establishing and monitoring standards for crime laboratories and conducting accreditation inspections of crime labs. The stated objectives of ASCLD/LAB's accreditation program are to: (1) improve the quality of

---

74 By contrast, as discussed below, we found cases that are examples of misconduct by individual analysts, including the "drylabbing" cases by controlled substances analysts Vipul Patel and James Price and the alteration of serology results and false testimony by James Bolding in the Dwight Riser case. Investigations by IAD of allegations of misconduct by HPD personnel, including Crime Lab analysts, is both necessary and appropriate.

75 The three current Crime Lab employees involved with the IAD investigations are Joseph Chu, Mary Childs-Henry, and Raynard Cockrell. In 2005, Mr. Chu was assigned to perform blood alcohol analysis in the Crime Lab. He currently is assigned to HPD's Major Offenders unit. Although Ms. Childs-Henry remains classified as a criminalist, she is assigned to CER where she performs non-analytical tasks related to the receipt and storage of drug evidence. Mr. Cockrell remains on the Crime Lab's organization chart as a controlled substances analyst, but he currently is on administrative leave.

laboratory services provided to the criminal justice system; (2) develop and maintain criteria which may be used by a laboratory to assess its level of performance and to strengthen its operations; (3) provide an independent, impartial, and objective system by which laboratories can benefit from a total operational review; and (4) offer the general public and users of laboratory services a means of identifying those laboratories that have demonstrated that they meet established standards.

Mr. Krueger told us that he did not recall any significant discussions during Mr. Christian's tenure as director of the Crime Lab about the desirability of attaining ASCLD/LAB accreditation. Mr. Krueger recalled that Mr. Christian's attitude regarding accreditation was that it was unnecessary to have an outside agency validate the work of the Crime Lab. Mr. Krueger told us that it never occurred to Mr. Christian or to him that there would be a benefit to having an outside inspection of the Crime Lab's operations and procedures because they believed the work of Lab was acceptable. Mr. Krueger told us that the Crime Lab's management believed the Lab's work was fine because they "never heard otherwise." Of course, absent outside reviews of the Crime Lab's operations and casework, there was no independent basis for Mr. Christian and Mr. Krueger's confidence in the quality of the Lab's forensic science work or how its work compared to the work performed in other crime labs.

There were additional factors isolating the Crime Lab from the larger general forensic science community. For example, Mr. Krueger never attended any ASCLD meetings during his entire tenure as the director of the Crime Lab. Mr. Krueger claimed that he sacrificed his attendance at these meetings in order to conserve funds for the training of analysts.[76] It is clear, however, that Mr. Krueger was an extremely introverted manager who simply was not disposed to participating in the forensic science community. He seemed genuinely unaware of the benefits of participating in such a larger community and unaware of the benefits that would accrue to the Crime Lab from doing so.

By the mid-1990s, management of the Crime Lab was considering accreditation as a goal. Mr. Krueger told us that no one within HPD ever prompted him to obtain accreditation for the Crime Lab, but he was concerned about the possibility that grant funding might one day be contingent on accreditation. Although Mr. Krueger consciously did not raise the issue of accreditation up the chain of command at that time because he felt the Crime Lab was not ready, he recalled discussing accreditation

---

76 Mr. Krueger said he was unaware, until we told him, that for at least some period of time the costs of attending national meetings of crime laboratory meetings was subsidized by the Federal Government.

with Assistant Chief Simmons. In his August 29, 1996 memorandum advising Assistant Chief Simmons that he was reorganizing the Crime Lab to move Dr. Sharma from the DNA/Serology Section to a newly created QA/QC position reporting directly to him, Mr. Krueger portrayed the move as a necessary step toward accreditation. Mr. Krueger stated: "[I]t is becoming more apparent that the crime laboratory is going to be required to work toward accreditation by ASCLD."[77]

Mr. Krueger's hope that he could accomplish twin objectives by moving Dr. Sharma out of the DNA/Serology Section, where he had been an ineffective and widely disliked supervisor, to the position devoted to preparing the Crime Lab's SOPs, training programs, and facilities for accreditation, proved to be an exercise in wishful thinking. Dr. Sharma proved to be even less productive in the QA/QC position than he had been in the DNA/Serology Section. Many Crime Lab employees recalled seeing him asleep in his office, and they joked about videotaping him. When we asked Dr. Sharma why he failed to make more progress on the SOPs since he appeared to have the bulk of four and a half years to devote to them in his new position, Dr. Sharma shifted blame to Mr. Krueger and claimed that he was not permitted to do any independent work on the SOPs. Dr. Sharma acknowledged that he viewed his transfer to the QA/QC position as punishment, and it is clear that his reaction was to pay little attention to taking ownership of what could have been a very significant role in advancing the QA/QC function.

Given his experience with Dr. Sharma, it was highly unrealistic for Mr. Krueger to expect that Dr. Sharma would make a meaningful contribution in the QA/QC position. By Dr. Sharma's own admission, he did approximately a year's worth of work in the four-plus years he remained in the position; a more exacting assessment would put the volume of work performed by Dr. Sharma at much less than that. In February 2001, acceding to the reality that Dr. Sharma was providing no meaningful assistance in the QA/QC position, Mr. Krueger assigned Dr. Sharma to assist the Controlled Substances Section by analyzing marijuana cases.

Ultimately, Mr. Krueger came to believe that accreditation was not a realistic possibility in light of the Crime Lab's chronic manpower shortages, the conditions created in the Lab by the persistent roof leaks at 1200 Travis Street, and the lack of progress in formalizing the Lab's SOPs and developing a QA/QC function. Assistant

---

[77] At least by the late 1990s, analysts in the Crime Lab also were aware of the importance of accreditation. During her testimony in the Josiah Sutton trial on July 7, 1999, Ms. Kim told the jury that "[t]here is an accreditation that we are trying to get a credit by [sic]" and that "our laboratory is working on [accreditation] right now." These assertions were, at best, gross exaggerations.

Chief Simmons believed that accreditation was not a priority for HPD because there were more pressing "structural problems" with the roof and obtaining equipment for the Crime Lab. Mr. Krueger told us that he never felt that the Crime Lab was far enough along in developing the formal procedures, systems, and documentation required for accreditation in order for him to be comfortable inviting outside inspectors in to review the Lab's operations.

Nevertheless, in a draft letter, dated June 17, 2002, that Mr. Krueger prepared for Chief Bradford to send to Houston City Council Member Carol Alvarado, Mr. Krueger wrote: "The laboratory staff has been working towards meeting all the guidelines necessary for accreditation. Approximately 80% of the documentation is complete." Based on the findings of the 2002 DPS audit and the substantial work on the SOPs and in other areas that was necessary for the Crime Lab to achieve accreditation in May 2005, it is clear that Mr. Krueger's assessment of the state of the Lab was, at best, exceedingly optimistic.

B. The National Forensic Science Technology Center Needs Assessment and Interim Director Frank Fitzpatrick

After Mr. Krueger's resignation, HPD entered into a contract with the NFSTC to provide a Needs Assessment with respect to the Crime Lab. ASCLD established the NFSTC in 1995 with the goal of creating a not-for-profit corporation, independent of ASCLD, that would "provide quality systems support, training and education to the forensic science community in the United States." On or about April 21, 2003, the NFSTC began performing its Needs Assessment of the Crime Lab.

On May 14, 2003, the NFSTC issued an Initial Summary of its findings to HPD concluding, among other things, that base funding for the Crime Lab had not historically included an equipment replacement fund or sufficient training funds. Even so, with the exception of computer hardware and networking, which were extremely limited, the Crime Lab's equipment -- and, in particular, its DNA equipment -- was modern and state-of-the-art. The Initial Summary also found that, with the exception of the Controlled Substances and Firearms Sections, the Crime Lab did not have documented training programs in place.

The NFSTC's immediate recommendation was that "a strong manager, not necessarily a forensic scientist, be placed in control of the lab." Following that recommendation, HPD began searching for an interim director. On July 23, 2003, HPD and the City entered into an agreement with the NFSTC to hire Frank Fitzpatrick as the interim director of the Crime Lab. Mr. Fitzpatrick was then the Director of the Forensic Science Division of the Orange County Sheriff-Coroner's Office. Under the agreement, Mr. Fitzpatrick accepted a 13-week assignment running the Crime Lab. Personnel who

worked in the Crime Lab during Mr. Fitzpatrick's tenure told us that his open and supportive style was a breath of fresh air for a forensic science laboratory that had operated under remote and isolated leadership for nearly a decade.

On July 31, 2003, the NFSTC issued its Needs Assessment, which contained detailed recommendations across a range of areas including laboratory supervision and management, training, communication within the Crime Lab, quality control, the space and design of the Lab, health and safety, and specifically-tailored recommendations for the individual sections of the Lab. These recommendations were provided to Ms. Rios when she became the head of the Crime Lab in October 2003.

Among other things, Mr. Fitzpatrick required all working analysts to take competency tests. The administration of these competency tests resulted in the suspension of toxicological analysis in the Crime Lab in October 2003. Pauline Louie, who was the longtime Criminalist IV supervisor over the Crime Lab's Toxicology and Controlled Substances Sections, also was the Lab's primary toxicologist performing casework. Accordingly, Mr. Fitzpatrick required Ms. Louie to submit to a toxicology competency test.

On September 26, 2003, Ms. Louie was provided three samples -- one urine and two blood -- for analysis, and she was requested to return her results by October 20, 2003. The samples were prepared and distributed by the College of American Pathologists ("CAP") as part of their nationwide proficiency testing program.[78] The samples originally were sent to Mr. Fitzpatrick's laboratory in Orange County, California, and then were forwarded to HPD.

According to the samples' manufacturer, the urine sample contained Phencyclidine, commonly known as PCP, and Triazolam; the first blood sample contained morphine; and the second blood sample contained Cyclobenzaprine and Nordiazepam. Ms. Louie returned her results for one of the samples before the October 20 deadline, but the other two samples were not returned until October 21 and October 22. Ms. Louie obtained the following results for the three samples

- Urine sample: Ms Louie correctly identified the presence of PCP but failed to identify the presence of Triazolam (a false negative result).

- Blood sample #1: Ms. Louie incorrectly identified the presence of PCP (a false positive) and failed to identify the presence of morphine (a false negative).

---

78 The CAP proficiency testing program is the largest peer comparison program in the world.

- Blood sample #2: Ms. Louie again obtained a false positive for PCP and failed to identify the presence of Cyclobenzaprine and Nordiazepam (both false negatives).

Before arriving at any conclusions as to the apparent false positive results for PCP that Ms. Louie obtained in both of the blood samples, HPD delivered the remaining portions of the blood samples to the Harris County ME's Office for analysis. The ME's Office failed to detect PCP in either of the blood samples, which was consistent with the manufacturer's original preparation of the samples and with the findings of the Orange County laboratory that had previously analyzed the samples. The results obtained by the ME's Office demonstrate that the samples had not been contaminated with PCP prior to being delivered to Ms. Louie for her competency test.

Ms. Louie was highly critical of the competency test administered to her. However, our review of Ms. Louie's competency test found that it was fairly administered. False negative results may be caused by a number of factors and typically would not have an impact on the suspect donor of the sample. However, false positive results call into question all of the results obtained by the analyst and may have serious consequences for the suspect donor.

As a result of the false findings she obtained in connection with her competency test, Ms. Louie was suspended from performing toxicological analysis in October 2003.[79] From October 2003 through present, the Toxicology Section has performed only blood alcohol tests, and it has not analyzed blood or urine samples for substances other than alcohol.

In March 2004, the District Attorney's Office requested that 369 toxicology cases analyzed by Ms. Louie for which viable samples still exist be re-tested by an outside laboratory. That re-testing project is complete, and we are advised by HPD that a discrepancy was found in only one of these cases. In that case, involving a urine screen performed in 1992, Ms. Louie identified the presence of numerous substances, including Butalbital. The re-testing laboratory found that, while the drug appeared to be present in the sample, the outside laboratory could not confirm the presence of Butalbital possibly because it was masked by another substance in the sample.

---

[79] Ms. Louie subsequently retired from HPD on July 30, 2004.

C. Irma Rios Becomes Head of the Crime Lab

Ms. Rios, who had led the outside audit of the Crime Lab's DNA/Serology Section in December 2002, became the director of the Lab on October 20, 2003.[80] During the interview process prior to accepting the position, Ms. Rios requested information about the Crime Lab, including budget information for the prior three years, caseload statistics, an organization chart, and information about how HPD handled media inquiries. Early in her tenure as director, Ms. Rios developed a strategic plan for the Crime Lab that focused on fundamental issues such as salaries for Lab personnel and improving the technological resources in the Lab.[81]

One of the immediate challenges Ms. Rios faced was hiring qualified analysts. As a result of the persistent negative media coverage of the Crime Lab arising out of the DNA scandals and the focus on analyst competency under Mr. Fitzpatrick, the Lab lost nearly half of its technical staff during 2003. While the low salaries offered by Crime Lab at the time were an obstacle to recruitment of new personnel, so too was the concern about whether the Lab would be able to recover and obtain accreditation as required under a new Texas state law promulgated earlier in 2003.

Under Ms. Rios, the Crime Lab embarked on the massive undertaking of simultaneously revising the SOPs for the Lab's general operations and for each of its analytical sections, developing a competent and effective QA/QC function, bringing the training of analysts up to appropriate levels, and preparing the Lab for the inspections necessary to obtain accreditation.

D. Accreditation

On May 10, 2005, the Crime Lab was accredited by ASCLD/LAB in the disciplines of controlled substances, blood alcohol analysis, questioned documents, firearms, and serology. This accreditation by a national body was the first in the Crime Lab's history. ASCLD/LAB accreditation was the product of a sustained effort on the part of HPD and the management and staff of the Crime Lab, and it was a significant and necessary step.

---

80 Although Ms. Rios is the head of the Crime Lab and reports directly to an Executive Assistant Chief, because of the City's structure for funding civilian jobs, her official position is "Assistant Director."

81 When Ms. Rios became the head of the Crime Lab, she and Mr. Bobzean, the number two person in the Lab, had desktop computers and email accounts.

Although the May 2005 ASCLD/LAB accreditation covered serology -- i.e., the screening of biology evidence for body fluids such as blood and semen that may be susceptible to DNA analysis -- it did not include DNA profiling work. The Crime Lab still had significant work to do to prepare for DNA casework -- including finding a qualified DNA technical leader, hiring and training DNA analysts, revising the Lab's DNA SOPs, and performing validation studies on the Lab's DNA instrumentation.

On June 19, 2006, ASCLD/LAB granted the Crime Lab provisional accreditation for its DNA operations. Accreditation of the DNA Section was provisional because it was based on inspection of DNA analysts' work on mock cases -- the Crime Lab did not have a body of actual casework to review because it had not yet performed any DNA analysis in live cases under the Biology Section's revised DNA SOPs and operations. The Crime Lab began performing DNA analysis and reporting results in active investigations in July 2006.

Because accreditation of the DNA operation was provisional, ASCLD/LAB required the Crime Lab to submit to another inspection in March 2007.[82]

---

82 The March 2007 ASCLD/LAB inspection went beyond merely covering the Crime Lab's DNA Section. Even though accredited crime laboratories typically undergo re-inspection on a five-year cycle, Ms. Rios requested that ASCLD/LAB inspectors review all of the analytical sections of the Crime Lab. Also, the ASCLD/LAB inspectors reviewed the Crime Lab's reorganized Trace Evidence Section for the first time.

Historical Case Reviews (1980 – 2004)

The core of our investigation of the Crime Lab's historical operations was the review of over 3,500 cases analyzed by criminalists in each of the forensic science disciplines practiced in the Lab. These cases provided invaluable insight into how the managerial and resource decisions, described in detail in above, impacted the analytical results that the Crime Lab's forensic scientists obtained and reported on a daily basis.

We identified similar issues across much of the Crime Lab's work, regardless of the section, including inadequate SOPs, lack of quality assurance and documented technical reviews, and poor documentation of the samples analyzed and the analytical work performed. However, we also found that many analysts and examiners in the historical Crime Lab were quite technically proficient. Despite some minor issues relating to documentation and other administrative issues, we found that the Crime Lab performed generally reliable, and in some cases very high quality, work in the areas of controlled substances analysis, firearms examination, trace evidence, toxicology, and questioned documents examination.

However, we identified a large number of serology and DNA cases that contained serious problems that called into question the reliability of the analytical work performed by the Crime Lab and/or the accuracy of the reported results in these cases. We identified major issues in 209 -- or 21% -- of the serology cases we reviewed from the 1980-1992 period. Nearly a third of the DNA cases we reviewed -- including four death penalty cases -- that the Crime Lab analyzed between 1993 and 2002 contained major issues. These are extremely troubling findings, particularly because serology and DNA analysis typically are performed in connection with investigations of the most serious crimes. HPD's and the Crime Lab's failures in training, supporting, and supervising its analysts are most starkly reflected in the Lab's serology and DNA cases.

I. Serology (1980 – 1992)

We reviewed a total of 1,020 serology cases processed by the Crime Lab between 1980 and 1992, including 850 cases related to currently incarcerated prisoners. Because serology involves the analysis of body fluids such as blood, semen, and saliva these cases typically relate to investigations of homicides and rapes. We identified major issues in 209 -- or 21% -- of these cases. We found significant problems in every step of HPD's process for handling biological evidence during this period -- from the collection, packaging, and storage of biological evidence, to the screening of evidence for body fluids such as blood and semen, to ABO typing and electrophoretic testing for genetic markers, to the interpretation and reporting of results.

Some of our most troubling findings, which are discussed in detail in this section of the report, include:

- The widespread failure of the Serology Section to perform genetic marker testing, such as ABO typing, on hundreds of cases that contained potentially probative biological evidence *and* involved a known suspect whose blood could be compared to the evidence. In fact, the Crime Lab failed to perform typing in 274 cases in which evidence was screened positive for blood or semen and in which the suspect was ultimately convicted and remains in prison today. The biological evidence in these cases potentially could have bolstered the prosecution of the defendants, or helped establish their innocence, and yet the Crime Lab never tested the evidence.

- Crime Lab serologists failed to use and to properly document crucial controls, and there was no meaningful technical review or quality assurance program in the Serology Section.

- Serologists were poorly trained, which resulted in an abundance of very serious technical and interpretive problems across dozens of cases.

- We found 110 cases in which a Crime Lab serologist failed to report potentially probative results that he or she in fact obtained, as reflected in his or her laboratory notes and worksheets. In many of these cases, it appears that the analyst was reluctant to report genetic typing results obtained from evidence samples that were not consistent with a known victim or suspect. We believe that serologists -- including Mr. Bolding, the head of the Serology Section, and Ms. Kim, one of the Section's most experienced and prolific analysts -- generally lacked confidence in their ability to obtain reliable ABO typing results and, therefore, were reluctant to report finding rare blood types or results that were not consistent with known profiles. In some cases, it appears that analysts tailored results to meet the expectations of investigators.

- There are three cases -- the Derrick Jackson capital murder case, the Maria Estrada rape and murder case, and the Dwight H. Riser case -- in which Mr. Bolding was responsible for misreporting the original results of testing, altering documentation without scientific basis, and causing probative results not to be reported. Each of these cases reflects a disturbing lack of integrity on the part of Mr. Bolding -- the Crime Lab's lead serologist who would become the head of its DNA operation as well. Mr. Bolding's conduct in the case of Mr. Riser, who remains incarcerated, appears to constitute outright scientific fraud and perjury.

A. Background Regarding Forensic Serology

The term serology refers to the study of blood and other body fluids, particularly blood group interactions. The forensic serology practiced in the Crime Lab during the 1980s and early 1990s primarily involved genetic marker typing relating to the four nominal blood types -- A, B, AB, and O.[83] For example, if a bloodstain on an item of evidence is determined through ABO typing to contain ABO type A factors, and a suspect is determined to be ABO type A, then the suspect is included in the population of potential contributors to the evidence. On the other hand, if the suspect is determined to be ABO type B, then he or she is excluded as a potential donor of the bloodstain evidence. Until they were replaced by DNA profiling technology in the early 1990s, the typing tests used in forensic serology were the only techniques available to forensic scientists to develop information as to whether specific individuals might be associated with biological evidence such as blood, semen, or saliva related to crimes, particularly homicides and sexual assaults.[84]

ABO typing is not limited to blood samples. In many people, ABO factors also are present in other body fluids, such as semen, saliva, and vaginal secretions. The population is divided into two groups with respect to the presence or absence of ABO factors in body fluids other than blood. Approximately 80% of individuals have detectable levels of their ABO type expressed in their other body fluids, and they are known as ABO "secretors." The remaining 20% lacks normally detectable levels of their ABO factors in their secretions; these individuals are known as ABO "non-secretors." Although useful in the investigation of homicides and other crimes, ABO testing of body fluid secretions was particularly valuable in the analysis of biological evidence related to sexual assaults.

The first step in forensic serology is to determine through presumptive testing whether biological material is present on evidence items collected by investigators and medical personnel. This examination is conducted using various presumptive tests that

---

83 From the 1960s on, forensic serology also included the characterization of other biochemical genetic markers present in body fluids such as certain polymorphic enzymes and proteins. As discussed below, the Crime Lab only rarely used such enzyme testing results to associate or disassociate evidence stains with respect to a victim or suspect.

84 For ease of reference and to provide helpful background for the discussion of significant issues we have identified in the serology work performed by the Crime Lab, we include in this section a brief general description of serology and certain common testing methods. For a more detailed discussion of technical aspects of serology, please refer to Appendix B of this report, "Technical Discussion of Serology Techniques Commonly Used by the Crime Lab."

can indicate whether a stain is likely to contain blood or semen and therefore be susceptible to genetic marker typing.

The Crime Lab typically would screen suspected bloodstains by applying a color test using the chemical phenolphthalein, which reacts to the protein hemoglobin found in blood.[85] The Crime Lab also commonly used a confirmatory test for blood known as the Takayama test, which is a micro-crystalline test also directed at detecting the presence of hemoglobin. If these tests resulted in positive readings, the stain would be confirmed to contain blood.

The Crime Lab generally used three types of tests to detect the presence of semen in evidence related to suspected sexual assaults. First, a serologist would use a microscope to attempt to visually confirm the presence of sperm cells in a sample extracted from an evidence stain and applied to a microscope slide. Second, the serologist might use a presumptive color test on a cutting from an evidence stain to detect the presence of acid phosphatase ("AP"), which is an enzyme secreted by the prostate gland into seminal fluid. Finally, Crime Lab serologists also used testing techniques to determine the presence or absence of a prostatic protein called p30, which is unique to seminal plasma.

If these tests indicated that an evidence specimen in fact contained blood or semen, then the serologist could attempt ABO genetic marker testing on the evidence. Absorption elution ("AE"), a form of direct ABO typing, is the generally accepted forensic serology testing method for determining the ABO factors present in bloodstain evidence.[86] Serologists sometimes used AE testing of bloodstains in conjunction with a reverse blood typing technique called the Lattes Crust test.[87] Serologists often used Lattes testing to obtain ABO typing results from scrapings of dried blood crust collected from non-porous surfaces, such as glass or a weapon (hence the term Lattes Crust test)

---

85 Hemoglobin is a protein found in red blood cells that is responsible for transporting oxygen and carbon dioxide in the bloodstream, and it gives blood its red coloring.

86 AE is known as a "direct" ABO test because the agglutination observed as a result of the antigen-antibody interaction in AE testing directly indicates which ABO antigenic factors, if any, are present in the sample. In other words, in AE testing, the presence of a specific ABO factor is indicated by observation of agglutination in the test well for that ABO factor.

87 The Lattes Crust test is known as a "reverse" typing test because it detects the presence of naturally occurring ABO antibodies in the plasma or serum portion of a bloodstain. The ABO antibodies in a person's serum are complementary to his or her ABO antigens present on the person's red blood cells. Thus, the detection of ABO antibodies through a Lattes Crust test can assist the forensic serologist to infer the ABO type of the donor of a bloodstain.

or from cuttings of bloodstains on clothing or other materials.[88] Absorption inhibition ("AI") was the generally accepted forensic serology method for determining ABO factors expressed in stains related to body fluids other than blood such as semen, saliva, vaginal secretions, perspiration, nasal mucous, or mixtures of these fluids. AI, unlike AE, is an indirect method for the detection of ABO antigens.[89]

If an evidence stain tested positive for the presence of blood, semen, or other body fluid, it was generally possible to determine the genetic characteristics (e.g., ABO type) reflected in the evidence sample. The serologist then could compare the genetic types of the evidence sample with those of known reference standards. A known reference standard is a sample of blood or saliva collected from a victim or a suspect who is potentially associated with an evidence stain. Depending on the nature of the crime under investigation and whether the evidence includes secretion stains, a crime laboratory might subject known reference blood standards both to ABO testing, in order to determine the victim's or suspect's ABO blood type, and to Lewis blood group testing, which is helpful to predict or confirm whether the donor can be expected to be a secretor whose ABO type is expressed in body fluids other than blood.[90]

During the 1980s and early 1990s, the Crime Lab very seldom compared the ABO types of victims and suspects with ABO activity detected in evidence samples to establish associations -- or disassociations -- between individuals and biological evidence. This was true even where presumptive screening indicated the presence of blood or semen in evidence stains *and* where there was a known suspect against whom ABO typing results related to such evidence could and should have been compared. In fact, we found such failures to do ABO typing and comparisons in 274 cases related to convicted defendants who remain incarcerated today. The Crime Lab's chronic failure to perform ABO typing and comparisons in cases where the serology may have produced probative or even exculpatory results -- including the hundreds of cases in which ultimately there were convictions -- is extremely disturbing.

---

88 The Lattes Crust test, however, is less sensitive than AE. Consequently, more bloodstain material must be consumed to conduct a Lattes Crust test than the amount needed for AE.

89 AI is referred to as an "indirect" test because the presence of an ABO factor in an evidence stain is determined by observation of a diminished level or absence of agglutination in the test solution related to that particular ABO factor. AI also is used to test known reference saliva standards obtained from a victim or suspect to determine whether he or she is a secretor -- i.e., a person whose ABO type is expressed in body fluid other than blood.

90 Lewis genes are related to an individual's ABO secretor status. Lewis testing of an individual's known reference blood sample may be used to infer one's ABO secretor status.

B. Results of the Serology Review

We reviewed a total of 1,020 serology cases processed by the Crime Lab between 1980 and 1992. This total includes all of the serology cases we have reviewed during the course of the independent investigation, including cases drawn from our original sample of serology cases, our recalibrated selection of substantive serology cases from the period 1987 through 1991, our work on serology conviction cases, and finally all serology incarceration cases from the period 1980 through 1993 and death penalty cases during that period in which the prisoner had been executed. We identified major issues in 209 -- or approximately 21% -- of the serology cases that we reviewed.

We classified each of the major issue serology cases we identified into one or more of the following five categories based on the types of errors reflected in the file and, where available, the underlying raw data related to the case: (1) failure to report a potentially probative finding; (2) incorrect interpretation or erroneous reporting of serology testing results; (3) reporting of a finding not supported by documentation contained in the file or recorded in the analysts' worksheets; (4) failure to perform a critical examination;[91] and (5) other errors, including misunderstanding of a serological or analytical concept, improperly altering test results or reported findings, possible drylabbing, and obtaining a demonstrably incorrect test result.[92] The chart below reflects the number of major issue cases we identified in each of these categories.[93]

---

91 As discussed below, HPD serologists failed to perform genetic marker typing in hundreds of cases in which an analyst positively identified the presence of a potentially testable body fluid -- such as blood or semen -- on an item of evidence *and* there was a known victim or suspect to compare against the evidence. Each of these cases could qualify as a failure to perform a critical examination. However, because of the pervasiveness of this problem, we decided not to classify such cases as containing major issues.

92 There are certain very serious deficiencies in the Crime Lab's historical serology work that were present in virtually every genetic marker typing case performed by the Lab during the entire period we reviewed. For example, as discussed below, Crime Lab serologists almost universally failed to use generally accepted forensic sciences principles and appropriate substrate controls. The absence of these standards and controls was contrary to generally accepted forensic science principles at the time and calls into question the entire body of serology work performed in the Crime Lab. Because these problems were so ubiquitous, however, we decided not to identify these deficiencies as major issues in individual cases unless the deficiency demonstrably affected the reliability of the result reported by the Crime Lab.

93 The number of major issue cases reflected in this chart is greater than the total number of individual major issue serology cases we identified (209) because some of these cases involve more than one type of major issue.

Types of Major Issues – All Serology Cases Reviewed

Category of Major Issue	Number of Cases Containing Type of Error	Percentage of Major Issue Cases Containing Type of Error
Failure to report findings adequately and completely	107	51%
Incorrect interpretation or erroneous reporting of results	73	35%
Unsupported finding	29	14%
Failure to perform critical examination	9	4%
Other	30	14%

With the substantial assistance of HPD, we identified a total of 850 serology cases processed by the Crime Lab during the period 1980 through 1992 that are related to a defendant who was convicted either by trial or guilty plea and remains incarcerated. Of these 850 prisoners, 28 currently are on death row. We found major issues in 180 -- or 21% -- of the serology incarceration cases, including in 12 of the 28 death row cases. The chart below reflects the number of major issue cases we identified among these serology incarceration cases, sorted by category of major issue.[94]

Types of Major Issues – Serology Incarceration Cases

Category of Major Issue	Number of Cases Containing Type of Error	Percentage of Major Issue Cases Containing Type of Error
Failure to report findings adequately and completely	92	51%
Incorrect interpretation or erroneous reporting of results	64	36%
Unsupported finding	26	14%
Failure to perform critical examination	7	4%
Other	26	14%

Finally, we also reviewed all 29 cases in which, between 1980 and 1992, the Crime Lab performed serology work in connection with an investigation related to a defendant who ultimately was executed. We reviewed these cases even though they do

[94] The number of major issue cases reflected in this chart is greater than the total number of individual major issue serology incarceration cases we identified (180) because some cases involve more than one type of major issue.

not fall within the definition of incarceration cases because the defendant already had been executed. We identified major issues in 12 of these execution cases. The most recent execution of a prisoner who was associated with a serology case processed by the Crime Lab in which we identified a major issue was that of Clyde Smith, Jr., who was executed by the State of Texas on February 15, 2006.[95]

C. Problems in the Crime Lab's Serology Work

Based on our comprehensive review of the Crime Lab's serology work between 1980 and 1992, we conclude that serology performed in the Crime Lab -- including screening for blood and semen and genetic marker typing -- during this period failed to meet generally accepted forensic science principles. Our review of over a thousand serology cases processed by the Crime Lab during the 1980-1992 period found pervasive and serious problems with the quality of work performed by serologists in the Lab, as well as with the presentation of the ABO typing results obtained by Lab analysts using various serology testing methods. We saw these problems in virtually every serology case we reviewed, even in those cases that we determined did not contain major issues. Moreover, these very significant deficiencies are not the result of isolated mistakes or interpretive errors made by individual serologists. Rather, they are the product of defective procedures employed in the Serology Section throughout the relevant time period, as well as the Crime Lab's systematic failure to adequately train and supervise its serologists.

In this section of the report, we provide a comprehensive discussion of the most significant problems with the serology work performed in the Crime Lab during the

---

95 We reviewed the serology work in Mr. Smith's case in February 2007. The major issues in that case were that, even though the Crime Lab performed ABO typing on 15 bloodstain samples recovered from the crime scene and obtained ABO type O results for 14 of those samples, the Lab failed to obtain the ABO type of the victim or suspect and failed to report any of the results of the ABO typing work performed on the evidence. While we consider these failures to be major issues from the perspective of evaluating the quality and reliability of the forensic science work performed in the case, we cannot assess whether proper reporting of the ABO typing results obtained by the Crime Lab would have had any potential impact on the prosecution, conviction, or sentencing of Mr. Smith.

As stated in our previous reports, in general, with respect to the prosecutions of any individual defendant discussed in our reports, our investigation is limited to reviews of the forensic science work performed by the Crime Lab and, in certain cases, the presentation of the analysts' findings in related criminal proceedings. We have not reviewed or considered other evidence, such as eyewitness testimony or confessions, that might have been available or introduced in such cases. We also make no assessment as to the likely guilt or innocence of any of the suspects or defendants or to the appropriateness of any punishment discussed in our reports.

1980s and 1990s. The issues include: (1) failure to perform potentially probative, or even exculpatory, ABO typing in a large number of cases, particularly sexual assaults; (2) improper processing, storage, and documentation of evidence; (3) inadequate and confusing documentation of the samples analyzed and the results of testing performed on evidence and known reference standards; (4) failure to use appropriate controls and the absence of meaningful quality control over the Crime Lab's serology work; (5) problems with presumptive testing for body fluids and the screening of evidence; (6) technical problems with ABO testing and the misinterpretation of ABO typing results; (7) failure to perform and report the results of enzyme testing; and (8) inaccurate, incomplete, and sometimes misleading reporting of the results of serological testing.

1. Systematic Failure to Perform Potentially Probative ABO Typing in Cases Involving Known Suspects

We reviewed 850 serology cases processed by the Crime Lab between 1980 and 1992 that relate to defendants who were convicted and currently remain incarcerated in Texas prisons. We found that the Crime Lab performed genetic marker analysis and comparison of ABO blood type factors detected in evidence, on the one hand, with the ABO types of victims and known suspects, on the other, in an alarmingly small proportion of the cases. This is troubling because *all* of these cases, by definition, involved a known suspect (whose name is reflected in the Crime Lab report) who eventually was convicted of an offense related to the crime for which evidence was sent to the Lab for analysis. We categorized each of the serology conviction cases from 1980 through 1992 that we reviewed based on the type of analysis applied.

Type of Analysis Performed in Serology Incarceration Cases
1980 through 1993

Category	Type of Analysis Performed	Number of Cases[96]	Approximate Percentage of Cases[97]
1	Inventory of Evidence Only	48	6%
2A	Screening for Blood or Semen: Results Positive – No ABO Typing of Evidence	274	32%
2B	Screening for Blood or Semen: Results Negative – No ABO Typing of Evidence	150	18%
3	ABO Typing of Evidence Only	139	16%
4	Comparison of Results of ABO Typing of Evidence with Known Reference Samples	186	22%
5A	Outside DNA Analysis: Match/Inclusion	43	5%
5B	Outside DNA Analysis: No Male Profile or Inconclusive	12	1%
5C	Outside DNA Analysis: Outcome Unknown	1	Less than 1%
5D	Outside DNA Analysis: Exclusion of Incarcerated Suspect	6	Less than 1%

As reflected in the above chart, the Crime Lab performed the full typing and comparison serology analysis necessary to develop probative information as to whether a known suspect could be included or excluded as a potential contributor to biological evidence in only a fraction -- 22% -- of the cases where such analysis was possible. The Crime Lab's failure to perform genetic marker testing of evidence, such as bloodstains

---

96 The total number of cases reflected in this column is slightly greater than the total number of serology incarceration cases that we reviewed because a limited number of cases received more than one classification. For example, certain cases in which the Crime Lab performed ABO typing and comparisons (Category 3) also were sent to outside laboratories for DNA analysis (Category 5), and those cases were classified under both categories.

97 The percentages provided in this column are included in order to present an approximate proportion of the serology incarceration cases in each analytical category. The proportions reflected in this column are only approximations because certain serology incarceration cases received more than one classification. For example, certain cases in which the Crime Lab performed ABO typing and comparisons (Category 3) also were sent to outside laboratories for DNA analysis (Category 5), and those cases were classified under both categories.

or swabs from a sexual assault victim, is particularly disturbing in Category 2A above where presumptive screening of evidence showed that body fluids, such as blood or semen, were present in the evidence. In *one third* of the serology incarceration cases we reviewed, presumptive tests for blood or semen were positive and there was a known suspect for comparison, and yet no genetic marker analysis was performed. In another 16% of the serology incarceration cases, ABO testing was performed on evidence, and yet no testing to determine the victim's or suspect's ABO types was performed so that a comparison to the evidence could be made.

The Crime Lab's failure to generate potentially probative ABO testing results in cases where it was possible to conduct such testing and comparisons to known reference samples where possible is very troubling. This failure has implications both for ensuring that the guilty are convicted and that the innocent are exonerated. From the perspective of making sure the guilty are convicted, this data indicates that the Crime Lab routinely failed to develop information that potentially could have guided investigators and strengthened the ability of the investigators and prosecutors to associate suspects with evidence in the case. From the perspective of making sure the innocent are exonerated, the Crime Lab failed to perform genetic marker analyses that, in some cases, might have excluded an individual suspect as a potential donor of evidence, such as semen stains related to a sexual assault. Particularly in light of a 1995 FBI study which found that, between 1989 and 1995, suspects were excluded by DNA testing in approximately 23% of cases,[98] it is entirely possible that properly performed ABO testing and, in particular, enzyme testing -- which was the prevalent technology in the forensic community throughout the 1980s -- would have established a scientific basis for excluding individual suspects in some percentage of these untested cases.[99]

Also potentially troubling are the six cases in which DNA testing performed by an outside laboratory did not include the suspect who currently is incarcerated as a potential contributor to the biological evidence analyzed (Category 5D). The DNA exclusion reported by the outside laboratory should not be understood to mean that the defendant was not involved in or guilty of the crime of which he was convicted. Even

---

98 *See Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence to Establish Innocence After Trial*, United States Department of Justice, Office of Justice Programs, National Institute of Justice (June 1996), at 20.

99 Obviously, the discriminatory power of ABO genetic marker testing is much weaker than that of DNA analysis. Nevertheless, ABO typing can result in the exclusion of an individual suspect. For example, based on ABO blood typing of evidence and comparison to the victim's and suspect's known blood types, the suspect can be eliminated as a potential contributor because an ABO factor present in evidence is foreign to both the victim and suspect, thereby indicating that a third person contributed to the evidence sample.

so, these cases raise questions about whether and to what extent the DNA evidence was used in each of them. The results of the DNA testing performed by outside laboratories in each of these six cases, the most troubling of which is that of Leroy Lewis, are summarized briefly below.

- **Leroy Lewis (L91-00532)**. In this 1991 sexual assault and murder case involving co-defendants Leroy Lewis and Robert J. Campbell, the Crime Lab sent evidence, including vaginal and anal swabs taken from the victim to the Serological Research Institute ("SERI") for DNA analysis. SERI performed DQ Alpha testing on the swabs and in a report dated August 14, 1991, concluded that "[t]here are at least two donors of the semen on the Vaginal Swab" and that "Leroy Lewis and Robert J. Campbell *could* be the donors" of the semen on the vaginal swab [emphasis in original]. SERI did not provide a frequency estimate for its DQ Alpha results.[100] On August 28, 2001, Christy Kim issued a report presenting SERI's conclusions; like SERI, she did not provide a frequency estimate. In 2002, DNA evidence in this case was analyzed by a Texas DPS crime laboratory. In a report dated July 22, 2002, the DPS laboratory concluded that, based on STR testing, Mr. Campbell could not be excluded from the mixture profiles found in the sperm fractions of both the vaginal and anal swabs. However, Mr. Lewis was "excluded as a contributor" to either of these samples.[101]

- **John Harris (L91-02007)**. This case relates to a 1991 aggravated kidnapping and sexual assault. The Crime Lab sent DNA extracts from the victim's vaginal swab and a flag to the Kleberg laboratory for DNA testing. The Kleberg laboratory eliminated both Mr. Harris and another suspect as potential donors of the semen samples on this evidence.[102]

- **Michael Coleman (L89-11985)**. The Kleberg laboratory performed RFLP testing on the vaginal swab in this sexual assault case and eliminated Mr. Coleman and two other suspects. However, the male profile that Kleberg found matched the

---

100 We calculated that the combined probability of inclusion based on SERI's DQ Alpha results is 55% in the African American population, 42% in the Caucasian population, and 43% in the Hispanic population.

101 Mr. Lewis is currently serving a 35-year sentence, and Mr. Campbell is on death row.

102 Mr. Harris was sentenced to 45 years in prison following his conviction by a jury.

DNA profile of Edward Stringfellow, who was a suspect in a number of sexual assaults and is currently imprisoned.[103]

- **Edward Stringfellow (L90-03607)**. As discussed above, Mr. Stringfellow was a suspect in numerous sexual assault cases. In this case, he was eliminated as a potential donor to semen evidence. However, his DNA profile matched a male DNA profile found in the evidence tested in Crime Lab case number L89-11985.

- **Errone Powers (L91-05760)**. DNA testing eliminated Mr. Powers and another suspect as potential donors to the semen evidence in this sexual assault case. However, the testing found the DNA profile of a third suspect, Terrence Clark.

- **Rosalio Alvarado (L91-03246)**. In this sexual assault case, the Crime Lab requested that an outside laboratory perform DNA testing on a semen stain on a comforter. The male DNA profile detected in the stain was that of the victim's husband.

In sum, the Crime Lab's chronic and systematic failure to conduct potentially probative genetic marker analysis on available evidence in these major crimes against persons reflects a troubling failure to fully and properly use the available tools of forensic serology in the criminal justice system during the 1980s and early 1990s. These failures undermined the ability of the system to properly serve victims', suspects', and the public's interest in fair and just law enforcement.

2. Improper Collection and Storage of Biological Evidence

Problems with HPD's forensic analysis of biological evidence during the serology era began with the collection, packaging, and submission of evidence to the Crime Lab. We reviewed numerous cases in which failures by investigators to properly collect and preserve biological evidence and reference standards impaired the Crime Lab's ability to perform genetic marker testing on the evidence or completely ruined the evidence for analysis. The problem was exacerbated by lengthy delays between the collection of samples and analysis by the Crime Lab. These factors contributed to the deterioration of evidence to the point where serology results no longer could be obtained.

Our review found that, during the 1980s and early 1990s, it was not uncommon for investigators to package evidence containing biological stains capable of being

---

[103] Mr. Coleman also was a suspect in a number of sexual assaults and is associated with at least five Crime Lab cases.

typed, such as bloodstained clothing, in sealed plastic bags without first drying the stains. Sealed plastic prevents stains from drying and allows bacteria and mold to grow and decompose or contaminate the biological material, rendering serology testing extremely difficult or impossible. One example of this problem that we identified during our case reviews is a 1990 case in which officers investigating a robbery-homicide submitted a white pullover shirt to the Crime Lab with the request that the Lab "examine the item for evidence of blood . . . if blood exists, attempt to type and compare with that of the complainant." The November 26, 1990 Crime Lab report prepared by Mr. Bolding stated that the shirt "was packaged wet in a plastic bag allowing putrefaction [sic] to continue. No tests were run on these items." Mr. Bolding's serology worksheet notes that the shirt had been submitted "in plastic bag," that he observed the evidence contained "mold, mildew & [was] putrified," and that therefore "no testing was performed."[104]

During the course of our case reviews, we discovered another common problem with the storage of biological material. The Harris County ME's Office often collected victim reference standards by taking vials of liquid blood from a victim's body, which were then frequently stored in freezers by the ME's Office or by the Property Room. Frozen storage of these vials of liquid blood caused the red blood cells in the blood sample to become hemolyzed -- ruptured or destroyed with the resulting release of hemoglobin -- rendering direct ABO and Lewis typing of the reference sample impossible. For example, in a 1992 homicide investigation, the Crime Lab serologist reported that "no blood type can be determined due to highly hemolyzed blood sample" as a result of the improper frozen storage of a liquid blood reference sample. The blood sample referred in the report was a vial of the victim's liquid blood that the Crime Lab analyst had retrieved from the Property Room freezer.[105] The appropriate remedy when a blood sample has become hemolyzed due to frozen storage or for some other reason would be for the serologist to make a stain of the hemolyzed blood and attempt AE testing. However, we found that Crime Lab serologists rarely attempted AE testing under these circumstances. Rather, as in this case, the serologist typically would conclude that no ABO typing results were obtainable from the sample due to hemolysis.[106]

---

104 Lab number L90-06774.

105 Lab number L92-01604.

106 Lewis typing requires intact red blood cells. Therefore, Lewis typing cannot be performed on dried bloodstains, and so the opportunity to determine Lewis types from known reference blood standards is lost when those known standards become hemolyzed due to frozen storage.

We also found that in many cases there was evidence of lengthy delays of weeks and even months between the submission of bloodstain evidence to the Crime Lab and the time a serologist began processing the evidence; such delays could well have contributed to the inability of the Crime Lab to obtain ABO typing results in certain cases, although there is no reliable way to confirm this in any particular case. In a number of cases, we found that the improper storage of perishable blood standards during prolonged delays between collection of the sample and analysis ultimately rendered comparison between forensic evidence and known reference standards impossible, thus depriving the investigation of the potential benefit of forensic serological analysis.

3. Problems with Screening of Evidence for Blood and Semen

As discussed above, the initial step in forensic serology is to determine through presumptive testing whether biological material, such as blood or semen, is present on evidence items submitted for analysis. We observed a number of problems with the Crime Lab's screening of evidence for the presence of blood and semen, including: (1) the continued use of the Takayama crystal test as a confirmatory test for blood, following an initial successful presumptive chemical test, even after the advent of DNA testing, which led in some cases to an unnecessary consumption of bloodstain material; (2) the misinterpretation of negative reactions in anti-human testing of blood as indicating conclusively that blood was of a non-human origin, even though false negatives resulting from such testing are common; (3) failure to perform confirmatory tests using antisera testing directed at common animal species (such as dogs, cats, deer, horses, and cows) following negative results from anti-human blood testing; (4) improper and inconsistent interpretation of AP presumptive tests for semen; and (5) lack of appropriate standards and controls in p30 electrophoretic testing for semen.

A particularly serious deficiency in the Crime Lab's screening of evidence for semen was the widespread failure to perform microscopic sperm searches. Microscopic identification of sperm cells (spermatozoa) has long been a common procedure and is an essential skill for forensic serologists. Microscopic sperm identification is a more effective and sensitive test for confirming the presence of semen than AP and p30 testing. Although some semen stains might be negative for spermatozoa (such as semen contributed by vasectomized males or from badly decomposed samples), spermatozoa or sperm heads usually outlast the survival of acid phosphatase in semen stains and their identification represents the most sensitive and conclusive means of detecting the presence of semen.

Despite the fact that sperm searches are such a valuable forensic serology tool, we found that Crime Lab serologists virtually never attempted to identify the presence of semen in stains on clothing, bedding, or other evidence items by performing

microscopic examination of smears taken from an extraction of a questioned stain. Instead, the Crime Lab relied exclusively on AP and p30 presumptive testing for semen on such items. Although difficult to prove conclusively solely through our case reviews, we believe it is highly likely that this practice led the Crime Lab in some cases to incorrectly conclude, based on false negative AP or p30 tests, that semen was not present on evidence when a sperm search would have in fact confirmed the presence of semen.

It also is apparent, from the cases we reviewed in which Crime Lab serologists performed sperm searches, that they were inadequately trained in sperm identification and the reporting of the results of such examinations. For example, HPD serologists generally performed microscopic sperm searches of hospital-prepared smears included in sexual assault kits submitted to the Crime Lab. However, in cases where the Crime Lab serologist noted "sperm heads only" -- meaning that the flagellum or tail of the sperm cell was not observable -- the analyst would incorrectly report that "no spermatozoa [was] detected."[107] Contrary to the Crime Lab's practice in these cases, the positive identification of the presence of semen based on the microscopic identification of "sperm heads only" was and remains a generally accepted practice in the forensic science community and was the norm throughout 1980s and early 1990s. It is incorrect for the Crime Lab serologists to have concluded that no sperm cells were detected when sperm heads in fact were observed. The consequence is that, in such cases, the Crime Lab erroneously reported that evidence was negative for semen when, in fact, potentially probative genetic marker analysis could have been attempted on the evidence.

4. Inadequate Documentation of Testing and Results

In many of the serology cases we reviewed, the documentation regarding tracking of evidence specimens as they moved through the Crime Lab's testing process was inadequate and confusing. The same specimens were in many cases described differently on submission forms, on various worksheets, and, finally, in the Crime Lab reports. This confusion could have been avoided by assigning unique laboratory specimen numbers to individual specimens and using those numbers throughout the case, consistent with generally accepted forensic science principles.

We also observed widespread problems with the documentation contained in the serology case files related to testing performed by the analysts. Frequently, test results

---

107 An example of such a case is the Crime Lab work related to incarcerated defendant Cedric Singleton, Lab number L84-05758.

recorded in raw data logs were maintained separately from the case files, were not incorporated into individual case files, and were not transferred into the analysts' worksheets included with the case files. In cases where results from the raw data logs were transferred into the analysts' worksheets, transcription errors were not uncommon. Crime Lab serologists rarely prepared a master table showing the test results for all of the evidentiary items tested, which was a common practice followed in many serology laboratories at the time. Criminalists in other laboratories commonly used such tables to keep track of all of the results achieved through genetic marker testing and to allow them to interpret how results related to individual samples. To facilitate our reviews, we spent a great deal of time preparing such tables in many cases in order to fully understand the work performed and results obtained in cases involving multiple biological specimens.

Finally, the serology files usually (but not always) lacked drawings, diagrams, photographs, or written descriptions of evidentiary items examined to document the appearance, size, and location of stains identified. Such documentation often is crucial in assessing the significance and probative value of biological stains, and the failure to include these types of descriptions is inconsistent with generally accepted forensic science principles.

5. Failure to Use Appropriate Controls and Lack of Quality Assurance

We found very few ABO typing cases in which Crime Lab analysts ran substrate controls in connection with AE and AI tests for ABO activity. This failure to run substrate controls is a very significant departure from the generally accepted forensic science principles prevailing at the time the work was performed. For the reasons described in detail below, the absence of substrate controls diminishes the significance of any of the antigenic activity detected by Crime Lab serologists because it is possible that the ABO activity detected was present in the material on which the biological stain at issue was deposited, rather than being attributable to the questioned stain itself.[108]

---

108 For a period of time in the early 1980s, Mr. Krueger, who later became the head of the Crime Lab, performed serological analysis including ABO typing. Mr. Krueger told us that he ran controls, including substrate controls, in connection with his ABO testing and that he recorded the results of the controls in his testing worksheets. We reviewed a number of cases analyzed by Mr. Krueger, and he was relatively unique among HPD serologists in that he in fact generally performed and recorded the results of controls. Mr. Krueger told us that he did not receive training at HPD on the use of controls and that he was taught the proper use of controls, which he described as "fundamental," while working in a crime laboratory in San Antonio prior to joining the Crime Lab in November 1978.

With all forms of ABO testing, it is critical to the reliability of the typing results that, whenever possible, the same ABO testing procedures used to test a stain also be applied to the unstained regions of the substrate material adjacent, or in close proximity, to the stain.[109] A forensic serologist must use substrate controls to determine whether the ABO factors detected in the questioned stain were part of the background material -- i.e., were contained in the substrate before the questioned stain was deposited on the substrate material -- rather than present in the body fluid evidence being tested. If background ABO factors are detected in the substrate control, the significance of the presence of those same factors in the questioned stain must be taken into consideration in the interpretation of the ABO factors detected.

For example, if a shirt has a semen stain that exhibits ABO type A activity and the substrate control test of a cutting of the shirt taken from a spot adjacent to the semen stain also exhibits ABO type A activity, the type A activity in the semen stain cannot be definitively attributed to the suspected semen donor. The reason is that, in this example, the wearer of the shirt might have been an ABO type A secretor and all of the type A activity could have originated from dried perspiration from the wearer of the shirt.

In a 1989 sexual assault case involving suspect Porfino Ayarzagoitia, we found a rare instance in which the Crime Lab serologist, in this case Ms. Kim, actually used and recorded the results of a substrate control. However, Ms. Kim failed to respond properly to the results of using the substrate control. The substrate control run by Ms. Kim exhibited ABO type A activity. In light of this failure of the control, the results of the AI test should not have been reported. Nevertheless, Ms. Kim did not report the failed substrate control separately from the A, B, and H[O] activity detected in the stain and chose not to repeat the AI test. Instead, she simply did a subtraction and reported the ABO types B and O activity on the stain without disclosing the detection of the type A activity in the substrate control and the evidence stain. This represents an egregious violation of principles of AI interpretation and alone would raise significant doubt about Ms. Kim's competence as a serologist.[110]

---

109 Substrate material is the fabric or surface upon which the questioned stain was deposited.

110 In this case, Ms. Kim also erroneously reported finding "no activity" on the vaginal swab. This finding is contradicted by Ms. Kim's raw data, which indicates that she detected ABO type A activity on the vaginal swab, which is foreign to both the victim and Mr. Ayarzagoitia, both of whom were ABO type O secretors. These results would have eliminated Mr. Ayarzagoitia as a sole contributor to the semen detected on the vaginal swab.

We found infrequent documentation of the use of positive and negative controls in connection with ABO testing. In addition, there is no indication in the worksheets of the majority of ABO typing cases we reviewed that Crime Lab serologists ran positive and negative controls alongside the evidentiary sample to detect possible contamination and to verify that the test procedures were functioning properly. For example, in AE testing, Crime Lab analysts should run a negative control of unstained cotton thread as well as positive controls of threads stained with known types A, B, and O samples. The apparent absence of such controls, and the obvious lack of documentation reflecting that such controls tested correctly, also are very significant departures from the generally accepted forensic science principles in the serology community in effect at the time the work in the Crime Lab was performed.

Our serology case reviews revealed the absence of written SOPs establishing requirements and guidelines for serologists across a wide range of issues, including, for example, the use of substrate and positive and negative controls, the interpretation of data and test results, the appropriate manner for resolving conflicting test results, the calculation of statistics, and proper standards for report writing. Needless to say, this was a significant failure that helps explain many of the problems we identified. The only guidance Crime Lab serologists had in the 1980s and early 1990s was contained in "methods manuals" obtained from an outside serological school and the FBI. These manuals contained step-by-step descriptions of procedures for performing serology tests but did not establish standards and procedures to be followed by Crime Lab serologists in the areas described above. The lack of such SOPs is a very serious departure from generally accepted forensic science principles and undoubtedly was an important cause of the pervasive problems we observed in the serology cases.[111]

Beginning in 1982, Mr. Bolding was the Criminalist III supervisor over the Serology Section. Typically, serology cases we reviewed were devoid of any indication that Mr. Bolding or anyone else reviewed the work performed by the Crime Lab's serologists (1) in order to identify technical errors related to testing and interpretation of results or (2) for administrative purposes, to ensure adequate and appropriate documentation of the work performed. Moreover, there is no documentation or other evidence showing that anyone performed technical or administrative reviews of the serology cases analyzed by Mr. Bolding, who, ironically, was the sloppiest of all of the Crime Lab's serologists based on our review of more than 1,000 serology cases. The

---

111 Mr. Krueger confirmed that the Crime Lab did not have serology SOPs during the period when he performed serological analysis in the early 1980s. Mr. Krueger recalled consulting an FBI manual about AE and AI techniques and for reference in interpreting the intensity of agglutination.

failure of the Crime Lab to perform routine technical and administrative reviews of serology cases -- and, in cases where such reviews might have been performed, to document the reviews -- also is a very significant departure from the generally accepted forensic science principles prevailing at the time.

6. Technical and Interpretive Problems with ABO Typing

We observed a variety of serious technical and interpretive problems with the Crime Lab's ABO typing work during the period 1980 through 1992. In addition to the overarching absence of proper controls, quality assurance, and technical reviews, which generally calls into question the reliability of the work of the Serology Section during this period, we observed the following common deficiencies and failures specifically with respect to the ABO typing performed by Crime Lab serologists: (1) the improper use and interpretation of the Lattes and AE testing systems, (2) the failure to determine victim and suspect secretor status, (3) the general failure to perform ABO typing on potentially probative and valuable saliva evidence, and (4) the failure to recognize and examine critical evidence.

a. Improper Use and Interpretation of Lattes and AE Testing

We found that there was a widespread misunderstanding among Crime Lab serologists of the relative merits and limitations of the Lattes and AE typing systems, which led to an overreliance on Lattes testing, even though it is less sensitive and effective than AE testing. Crime Lab serologists fundamentally misunderstood and were confused about the proper interpretation of ABO typing results obtained from these systems and were generally unable to reconcile seemingly inconsistent Lattes and AE results. The widespread misapplication and misinterpretation of Lattes testing by Crime Lab serologists was the consequence of inadequate training and incompetent technical supervision throughout the period we reviewed.

The Lattes test is one of the earliest ABO typing systems developed for use on bloodstain evidence. Lattes testing is designed to detect the presence of antibodies found in the blood serum of most people. Specifically, the Lattes test is designed to detect the presence of anti-A and anti-B antibodies in bloodstains. Accordingly, as discussed above, the Lattes test is a form of "reverse" ABO blood typing.

The Lattes test can be useful for identifying an ABO type O bloodstain when anti-A and anti-B antibodies are positively detected in conjunction with properly administered standards and controls. However, the same does not hold true for using the Lattes test for the identification of ABO type A, type B, or type AB bloodstains. The reason is that, while the presence of both type A and type B antibodies confirms the bloodstain as ABO type O, the absence of one or both anti-A and anti-B antibodies

cannot be interpreted to confirm the presence of ABO type A, type B, or type AB antigens for reasons related to variations in the detectability of anti-A and anti-B antibodies. By comparison, the ABO antigens for which the AE system tests outlast their corresponding antibodies in dried bloodstains by a wide margin. Thus, the AE method used to detect ABO antigens is much more sensitive and interpretable than the Lattes system.

These interpretive rules relating to Lattes testing are fundamental and were commonly understood within the forensic serology community during the entire period under review. Nevertheless, we found numerous cases where Crime Lab serologists failed to adhere to these interpretive rules, with the consequence that serologists frequently misinterpreted and misreported Lattes results or reported "inconclusive" ABO typing results because they were unable to reconcile their interpretation of Lattes testing with AE results.

In a 1982 homicide investigation related to currently incarcerated defendant Larry Norman Anderson,[112] Donald Krueger committed this error, placing excessive reliance on Lattes testing and misinterpreting the Lattes test results. Mr. Krueger found that the victim was ABO type A. He also performed ABO typing on a number of evidence items, including Lattes testing only on bloodstains from a knife, Mr. Anderson's left boot, a trash can lid, the bed of a pickup truck, and droplets found on the floor of a doorway at one of the crime scene sites. Mr. Krueger's worksheets reflect that he interpreted his Lattes results for each of these items as ABO type A, and his April 9, 1982 Crime Lab report concludes that "human blood, type 'A'" was detected on each item. However, Mr. Krueger did not perform AE testing on any of these items. The proper interpretation of Mr. Krueger's Lattes results is that the bloodstains he tested could have originated from either an individual of ABO type A or from an individual of ABO type O whose anti-A antibodies were not detectible in the evidence samples. Mr. Krueger should have either confirmed his Lattes results through AE testing or reported the Lattes results as indicating the presence of ABO type A or ABO type O on the evidence. He did neither.

We also found numerous cases in which Crime Lab serologists reported ABO typing results as "inconclusive" based on their misinterpretation of Lattes and AE results. In a 1985 homicide investigation related to currently incarcerated defendant Russell Gonzales,[113] Christy Kim performed ABO typing work. She performed Lattes and AE testing on a bloodstain from a flannel shirt. Her worksheet reflects that she

---

112 Lab number L82-02512.

113 Lab number L85-05308.

obtained a positive ABO type B result through Lattes testing and a strong ABO type O result through AE testing. Based on an apparent misinterpretation of her Lattes and AE results, Ms. Kim reported that "[h]uman blood having inconclusive typing results, was detected from the flannel shirt." Assuming the test was properly performed, the AE result Ms. Kim obtained was reliably interpretable as a stand-alone test, with or without an accompanying Lattes test, because AE is a much more sensitive test for ABO antigens, which themselves are more stable than the corresponding antibodies toward which Lattes testing is directed. In this case, a properly trained serologist with a firm understanding of the science underlying the AE and Lattes testing would have reported the presence of ABO type O in the bloodstain on the flannel shirt.[114]

b. Failure to Determine Victims' Secretor Status

The cases we reviewed reflect that nearly all of the sexual assault kits received by the Crime Lab included known reference blood standards from the victim. Unfortunately, we found that Crime Lab serologists often did not perform Lewis typing of victims' known blood standards, which resulted in the failure to obtain valuable information that was critical to the determination of the ABO secretor status of the victims. This failure to perform Lewis typing was particularly problematic in cases where saliva standards were not or could not be obtained, such as from a dead victim with a bloody mouth cavity, for AI testing to determine secretor status. Without determining the ABO secretor status of sexual assault victims, through Lewis testing or AI testing on known reference saliva standards, it was often not possible for the Crime Lab to interpret whether ABO factors detected in evidence samples were foreign to the victim and therefore potentially attributable to the assailant.

A 1986 case in which a woman was raped and her husband murdered is an example of a case that suffered from the Crime Lab's failure to determine the sexual assault victim's secretor status through Lewis typing of her known reference blood sample.[115] The Crime Lab determined that both victims were ABO type A. However, the Crime Lab did not perform Lewis typing on their known reference blood standards in order to determine each victim's secretor status, and no known saliva reference standards for either victim were submitted to the Lab. The Crime Lab found semen stains demonstrating ABO type A and type O activity on the female victim's underwear, the vaginal swab included in the rape kit, a sock, and a cutting from the

---

114 No known reference samples from the victim or suspect were submitted in this case, so it is not possible to determine based on the case file whether the ABO type Ms. Kim detected, but failed to report, on the flannel shirt was consistent with either the victim or the defendant, Mr. Gonzales.

115 Lab number L86-00766.

front seat of the vehicle. The Crime Lab determined that the suspect in this case was an ABO type O non-secretor and, therefore, could not be eliminated as a possible contributor to the semen stains in this or any other sexual assault case.

The critical question that went unanswered by the Crime Lab due to its failure to determine the victim's secretor status is whether the ABO type A and type O activity in the semen stain evidence was foreign to the female victim. If the female victim were determined to be an ABO non-secretor, then the ABO type A and type O activity detected in the semen evidence could not have originated from either the female victim or this named suspect. Moreover, if the Crime Lab had done the work necessary to determine the secretor status of the murdered husband and determined that both he and the female victim were ABO non-secretors, then the semen would have had to originate from someone other than either the husband or this defendant. These potentially very probative questions, however, were left unresolved as a consequence of the Crime Lab's failure to conduct Lewis typing of the known reference blood standards from the female victim and her husband.

Lewis testing of known reference blood standards is relatively easy and straightforward. Lewis testing is conducted directly on the red blood cells of the known reference standard and can easily be performed in conjunction with the direct ABO typing of the reference standard. The benefits of routine Lewis typing greatly outweigh the marginal time and effort required to generate the results regarding the donor's secretor status. Nevertheless, conducting Lewis testing on victims' known reference standards was the exception rather than the rule in the Crime Lab.

c. Failure to Test Saliva Evidence

Saliva secretions extracted from, for example, cigarette butts left at crime scenes have long been understood by police investigators and forensic scientists to be a potentially valuable source of evidence for identifying suspects. We were surprised to find that, while forensic serologists around the world routinely performed ABO typing analysis on saliva extracted from cigarette butts during the relevant time period, Crime Lab serologists very rarely, if ever, did so. During our review of over 1,000 serology cases processed by the Crime Lab between 1980 and 1992, we found no case in which the Crime Lab screened cigarette butts or breast swab evidence for the enzyme amylase, which is an indicator of the presence of saliva, and only one case where ABO typing was attempted on such evidence. The Crime Lab's failure to perform ABO typing on saliva evidence deprived HPD investigators of a source of evidence that is potentially highly probative.

We saw this failure to conduct ABO typing of saliva secretions on the cigarette butt evidence in a 1980 capital murder investigation. An investigator submitted to the

Crime Lab two cigarette butts collected from an ashtray next to the murder victim's bed and requested that they be analyzed "to find out what blood type the smoker was." The Crime Lab analyst's notes indicate that he did not type the "cigarette stubs due to the fact that they are contaminated w[ith] ashes and there are no samples to compare them with." The analyst's assertion that saliva on the cigarette evidence was not capable of being typed because of "contamination" from ashes is incorrect and reflects a lack of training and forensic experience. The presence of ashes on cigarette butts, in fact, is no barrier to AI testing and does not constitute scientific justification for failure to attempt ABO typing on the items. Moreover, the lack of a victim reference standard at the time the cigarette butts were submitted to the Crime Lab does not justify the analyst's failure to screen the items for amylase and to attempt to obtain the ABO type of the saliva evidence.

d. Failure to Examine Critical Evidence

As discussed above, our review of serology incarceration cases identified 274 cases in which screening tests performed by the Crime Lab detected blood or semen in evidence submitted to the Lab, and yet serologists never attempted genetic marker analysis on the items. By definition, each one of these cases involved a known suspect -- who ultimately would be convicted of a serious crime and remains incarcerated today -- from whom a known reference standard could have been obtained for analysis and comparison to the evidence samples submitted to the Crime Lab. Therefore, all 274 of these cases are instances in which the Crime Lab failed to conduct potentially probative examinations of forensic evidence that might have helped establish the defendant's guilt or innocence.[116]

In addition to those cases, we identified 9 serology cases in which the Crime Lab could have -- and should have -- performed a potentially critical analysis, but failed to do so. In the 1991 sexual assault and murder of a four-year-old girl, of which current death row inmate Demetrius Simms was convicted, the Crime Lab failed to examine potentially significant evidence. The victim was abducted on June 1, 1991. Four days later, on June 5, 1991, her nude and decomposing body was found in a wooded area. Nearby, police found the victim's shoes and clothing as well as a "torn white shirt." The police report states that "it is unknown if this shirt was left by the suspect, but it is

---

116 Because it was so common for the Crime Lab to fail to perform genetic marker typing on evidence even where analysts obtained positive screens for blood and semen and there was a known suspect -- approximately one-third of the serology incarceration cases we reviewed are such cases -- we did not classify each of these cases as a major case under our system. Rather, this issue is more properly characterized as a systemic failure of the Crime Lab to exploit available biological evidence.

suspected that the suspect may have wipe [sic] his penis with the shirt after sexually assaulting the complainant."

On June 6, 1991, a homicide investigator submitted a report intended to "notify crime lab personnel that evidence in this case has been submitted to the crime lab and requires analysis." The report reflects that among the items of evidence submitted to the Crime Lab were the victim's shoes and clothing and vaginal and rectal smears and swabs taken during the victim's autopsy, as well as the "white section of a torn short" found by investigators at the scene, which they suspected might contain a semen stain from the perpetrator. Neither the Crime Lab report nor the analyst's worksheets reflect that any testing was performed on this critical item of evidence to determine whether it actually contained a semen stain.

7. Failure to Perform and to Report the Results of Enzyme Testing

Polymorphic enzyme and protein genetic marker testing was a form of serology testing conducted routinely by the Metropolitan Police Forensic Science Laboratory (New Scotland Yard) in London, England by the end of the 1960s. During the 1970s, crime laboratories in the United States were validating and implementing this type of genetic marker analysis in forensic serology casework. In 1977, the Federal Government funded the development of a Bloodstain Analysis System ("BAS") at the University of California at Berkeley, which resulted in the development of the Groups I, II, and III electrophoresis systems. The BAS empowered forensic serologists to combine nine genetically independent marker systems into three electrophoresis procedures, which exponentially improved the discriminatory power of traditional ABO typing. For example, the likelihood that two unrelated, randomly-selected individuals have the same ABO type could be close to 1 in 2. The addition of enzyme and protein testing to traditional ABO analysis could improve the discriminatory power of serological results in the same case to as high as approximately 1 in 500.

Forensic serologists in the United States were widely trained in the use of the Groups I, II, and III electrophoresis systems during the late 1970s and early 1980s. Ultimately, the BAS electrophoresis procedures were employed by forensic serologists in more than 135 crime laboratories in the United States. Although Crime Lab serologists were familiar with this technology and records of electrophoresis runs reflect that they experimented with such testing as early as July 1982, it is clear, based on the records we reviewed, that Lab serologists vastly underutilized and improperly practiced polymorphic enzyme and protein genetic marker testing throughout the nine-year period between July 20, 1983 and June 10, 1992. During this period, the Crime Lab's entire serology staff averaged only 55 electrophoresis runs per year, many of which appear to be training or proficiency exercises conducted on non-probative samples and not associated with a case number. We found very few cases in which the

Crime Lab actually reported the results of electrophoretic testing, even in cases in which records reflect that testing was performed. This constitutes a striking underutilization of a widely-accepted and relatively powerful forensic science tool.

Given the general incompetence demonstrated by Crime Lab serologists in performing enzyme and protein testing, however, the rarity with which they applied this technology in actual casework might have been fortunate in retrospect.[117] Our review of the Crime Lab's electrophoresis logbooks found that the Lab's enzyme and protein testing suffered from poor procedures, inadequate standards and controls, sloppy recordkeeping, and frequent misinterpretation of electrophoresis results. In general, the Crime Lab's electrophoresis work was dismal and fell well below principles of performance generally accepted in the field of forensic serology during the 1983 to 1992 timeframe.

A 1986 sexual assault case provides an excellent example of electrophoresis results obtained by the Crime Lab, which in this case actually were reported, that, under the circumstances, we found to be potentially unreliable.[118] Former Crime Lab serologist Holly Hammond performed ABO and enzyme testing on known reference samples taken from the female victim and the suspect, Danniel Luken, as well as on semen evidence on a vaginal swab included in the sexual assault kit. In her July 13, 1987 report, Ms. Hammond stated that the victim was an ABO type B secretor, PGM 2+ and EsD 1. She typed Mr. Luken as an ABO type B secretor, PGM 1+ and EsD 2-1. She reported finding ABO type B and type H activity, PGM 2- and EsD 1 on the vaginal swab. Based on the apparent differences in PGM results for the semen stain, the victim, and Mr. Luken, Ms. Hammond reported that "the suspect Daniel [sic] Luken is excluded as a possible donor of the semen on the vaginal swab."

Other overwhelming evidence in this case, however, contradicted Ms. Hammond's enzyme testing results and, in light of the widespread problems we observed in the Crime Lab's electrophoresis testing, there is reason to be skeptical about her exclusion of Mr. Luken. In this case, the victim was a 57-year-old woman who was sexually assaulted in her townhouse by an intruder who also demanded money. After

---

117 This, of course, is not the appropriate measure to determine whether the Crime Lab performed properly during the serology era. The people of Houston deserved -- and thought they had -- a Crime Lab that was staffed with an appropriate number of qualified, properly trained, and competent serologists who were equipped to take full advantage of generally accepted forensic serology techniques and technology to assist just enforcement of the criminal laws. Unfortunately, HPD did not provide the people of Houston with a competent serology laboratory.

118 Lab number L86-03501.

raping the victim, the assailant fell asleep in her bedroom. The victim escaped and called police, who found Mr. Luken still asleep on the victim's bed and immediately arrested him. Mr. Luken told investigators that he had broken into the victim's house to collect $800, had sexual relations with her, fell asleep, and was awakened by the police. The victim confirmed repeatedly that she had not had intercourse within a month prior to the assault, and, therefore, the semen detected on the vaginal swab was a result of this assault. If there is a reasonable explanation for the results reported by Ms. Hammond, we could not confirm it because, in this case, the raw data related to her testing were not recorded in the Crime Lab's electrophoresis logbook and there are no photographs of her electrophoresis gels.[119] According to the police report in this case, after a three-day trial, Mr. Luken was convicted in a related case and sentenced to 20 years in prison.

8. Problems with the Reporting of Serology Results

Throughout the time period covered by this investigation, the final "reports" issued by the Crime Lab actually are supplements to the HPD investigative police reports. The Crime Lab's serology reports usually contained only a few sentences, including a general description of the evidence received by the Lab, a statement as to whether body fluids were identified on the evidence samples, and a conclusory statement of the ABO types detected. Frequently, not all typing results were presented in the report, and sometimes the supplement did not indicate the item of evidence from which an ABO typing result was obtained. Occasionally, a report included a statement as to whether the suspect could have contributed to the sample tested, but usually even that level of analysis was omitted from the Crime Lab's reports. As discussed in detail below, we found no cases in which the Crime Lab reported the statistical significance of the ABO typing results it obtained.

a. Selective Reporting of ABO Typing Results

One hundred and ten of the major issue serology cases we identified involve the serologists' failure to report potentially probative serology results that the analysts in fact obtained, as reflected in raw data or in the analysts' laboratory notes or worksheets. Often, we found an apparent reluctance on the part of Crime Lab serologists to report typing results obtained from evidence that were not consistent with the known ABO type of either a victim or a suspect. Ethical standards in the practice of forensic science

---

119 Although Ms. Hammond's reported electrophoresis results might have been in error, to her credit she reported them and interpreted her findings. We have seen a number of examples of cases in which other Crime Lab serologists, including Mr. Bolding and Ms. Kim, failed to report typing results that appeared to contradict other evidence in the case.

require full disclosure of all relevant analytical test results without regard to the potential impact on an investigation or prosecution. Our serology case reviews reflect many instances of failure to report analytical results that would have weakened the prosecution's case or strengthened the case for exonerating the defendant.[120]

Without speaking to the Crime Lab's two central serologists active during the 1980s and early 1990s -- Mr. Bolding and Ms. Kim -- about these cases, it is difficult to determine whether this pervasive pattern of avoiding the reporting of results inconsistent with the victim or a known suspect is attributable to the analysts' lack of confidence in their ability to obtain reliable ABO typing results or to scientific fraud of the most pernicious kind with the motive to secure convictions rather than do justice. Regardless of the individual serologist's state of mind, however, such practices are intolerable in a forensic science laboratory and undermine confidence in the integrity of the criminal justice system.

Below, we discuss a few of the most troubling examples of cases in which the Crime Lab obtained potentially probative ABO typing results but appears to have selectively failed to report those results because they did not support the inclusion of a suspect.

- **Charles E. Hodge** pleaded guilty to one count of aggravated sexual assault and *nolo contendere* to two other counts of aggravated sexual assault.[121] He was sentenced to 35 years in prison.

  This case involved an alleged sexual assault that occurred on November 12, 1986. Following the assault, an examination of the victim was performed that included the collection of vaginal and cervical swabs. On March 11, 1987, Ms. Kim found semen present on both the vaginal and cervical swabs contained in the rape kit and, through AI testing, found ABO type B activity on both swabs. On August 7,

---

120 There are rare examples of the Crime Lab failing to report potentially inculpatory findings that might have aided the prosecution of a known suspect. For example, in a 1989 case involving convicted defendant Norman Jackson, Ms. Kim's ABO typing of a bloodstain on the suspect's shorts detected ABO type AB, which is a rare blood type that was consistent with the ABO type of the victim. Nevertheless, Ms. Kim reported the results of her testing of the stain on the shorts as inconclusive. As discussed below, we found that Crime Lab serologists were extremely reluctant to report ABO type AB findings, which probably reflects a general lack of confidence in their own ability to obtain reliable ABO typing results or a recognition that, for some reason, the Lab was producing errant ABO type AB findings.

121 *Texas v. Hodge*, Cause Nos. 463510, 463511, 463534 (Harris County, Tx.). A robbery charge was dismissed at the time of Mr. Hodge's guilty plea.

1987, Ms. Kim tested known blood and saliva reference samples from both the victim and Mr. Hodge. In her report dated September 25, 1987, Ms. Kim accurately reported the results of her ABO testing -- the complainant was determined to be an ABO type B non-secretor, and Mr. Hodge was determined to be an ABO type AB secretor.

Based on these results, Mr. Hodge -- an ABO type AB secretor whose ABO activity would be detectable in his semen -- could not have contributed to the semen sample found on the vaginal and cervical swabs tested by Ms. Kim, which demonstrated *only* type B activity and *not* type A activity.[122] Nevertheless, Ms. Kim stated in the Crime Lab report that "[b]y these findings the defendant could have contributed semen on the vaginal and cervical swabs." Ms. Kim's ABO testing actually supported the opposite conclusion -- that Mr. Hodge should have been eliminated as a possible contributor of the samples obtained from the vaginal and cervical swabs.

- **Derrick Leon Jackson** is a death row inmate who was convicted in a capital murder case in which the Crime Lab performed extensive serological testing.[123] In 1988, Mr. Bolding obtained ABO typing results from a bloodstain sample taken from the scene of a grisly double homicide that indicated the sample was foreign to both the victims and the individual whom investigators originally suspected of the killings. At the time, however, Mr. Bolding reported these results as "inconclusive," perhaps because the results were not consistent with investigators' initial theory about who may have committed the crime. The investigation languished until 1995 when Mr. Jackson became the prime suspect. Mr. Jackson's ABO type was consistent with the foreign ABO factor Mr. Bolding had detected in 1998, which he originally described as "inconclusive." Without performing any additional testing, Mr. Bolding altered his worksheets to include previously absent conclusive interpretations of his original typing results performed in 1988 and issued a new report stating that ABO activity consistent with Mr. Jackson's ABO type was found in two bloodstain samples recovered from the crime scene.[124]

---

122 Moreover, because the victim was an ABO type B *non-secretor*, the ABO type B activity Ms. Kim detected on the vaginal and cervical swabs was foreign to the victim. Therefore, Mr. Hodge could have been eliminated as a potential donor of the samples on the swabs.

123 Lab number L88-08130.

124 A more detailed discussion of the Derrick Jackson case appears in our Fifth Report at pages 24-28.

- **Benjamin Mao and Leonard Francis** were suspects in a 1987 sexual assault case in which Ms. Kim found that the victim was an ABO type O secretor, Mr. Francis was ABO type B, and Mr. Mao was ABO type O. Ms. Kim detected ABO type O activity on the vaginal swab contained in the victim's sexual assault kit. However, Ms. Kim reported only that Mr. Francis was ABO type B, that Mr. Mao was ABO type O, and that "type 'O' secretor activity was detected on the vaginal swab previously submitted." Ms. Kim did not report that the victim was an ABO type O secretor and that, therefore, no ABO factors foreign to her were detected on the vaginal swab. Accordingly, because no ABO factors foreign to the victim were detected on the swab, no semen donor in the male population could be excluded as a contributor of the semen on the swab -- a fact Ms. Kim did not report. Even more significantly, neither Ms. Kim nor another HPD serologist who tested the case months earlier reported the presence of ABO type A activity detected in a bloodstain on the victim's tennis shoes, which was foreign to the victim and to both of the suspects, Mr. Francis and Mr. Mao.[125] The unreported ABO type found on the tennis shoes certainly was probative in that it suggests that an individual other than Mr. Francis or Mr. Mao could have been involved in the assault.[126]

- **Charles Pacholsky** pleaded guilty to a 1989 homicide. Ms. Kim performed ABO typing of numerous bloodstain samples taken from the victim's residence, where the victim was killed, as well as reference samples obtained from the victim, Mr. Pacholsky, and two other suspects. Ms. Kim's August 18, 1989 Crime Lab report, written well after investigators had focused on Mr. Pacholsky, states that she determined that the victim and Mr. Pacholsky both were ABO type O. She reported that one of the other suspects was ABO type A. Ms. Kim's testing worksheets, dated May 1, 1989, reflect that she obtained a strong AE result indicating the presence of ABO type A factors on the swab of a bloodstain collected from the door frame of the front porch at the victim's residence -- a result that was not consistent with the ABO type of the victim or Mr. Pacholsky but was consistent with the ABO type of one of the other original suspects in the

---

125 On March 23, 1987, Mr. Mao pleaded guilty to aggravated robbery and was sentenced to 45 years in prison. The kidnapping and sexual assault charges against him were dismissed. Similarly, Mr. Francis pleaded guilty to aggravated robbery on April 9, 1987, and the rape, kidnapping, and sexual assault charges against him were dismissed. Mr. Francis was sentenced to life in prison. Curiously, Ms. Kim's Crime Lab report is dated February 9, 1988, nearly a year after these guilty pleas.

126 A more detailed discussion of the Mao/Francis case appears in our Fifth Report at pages 29-30.

case. Despite the strength of this result, Ms. Kim reported that her ABO typing of the sample from the "front porch door frame" was inconclusive.[127]

In other cases, it appears that selective reporting by Crime Lab serologists was motivated by a concern that the serology results obtained, if reported, might be questioned by investigators or embarrass the analyst. For example, in a 1987 homicide case, Ms. Kim reported only that the "victim was determined to have type 'A' blood" and that "type 'A' human blood was detected on the possible blood samples from house (#1-#4)."[128] She failed to report, however, that she had obtained ABO type O results from three bloodstains taken from a car and one bloodstain from the house. She also failed to report detecting ABO type B activity in a bloodstain on a pair of jeans. In other words, she failed to report any of her ABO typing results on bloodstains that were inconsistent with the ABO type of the victim.

b. Failure to Report ABO Type AB Results

We found at least 30 cases in which Crime Lab serologists, including Mr. Bolding and Ms. Kim, failed to report finding ABO type AB activity in evidence samples. In case after case, we observed that the Crime Lab analysts reported ABO type AB results as "inconclusive," or omitted reference to the results of their testing from the Lab report altogether. It appears that because ABO type AB is relative rare -- only approximately 3 to 5% of the population of the United States is ABO type AB -- Crime Lab serologists were extremely reluctant to present findings indicating the presence of that ABO type in evidence samples.

We believe that this widespread reluctance to report findings indicating the presence of ABO type AB in evidence stains likely reflects that Crime Lab serologists were generally uncertain about, and lacked confidence in, their ability to obtain reliable ABO typing results. Because ABO type AB is relatively rare, analysts may have been uncomfortable reporting the presence of that ABO type in evidence samples unless the results clearly were consistent with the known reference sample of a victim or suspect. Another possibility could be that the analysts recognized that for some reason, not reflected in any of the materials we reviewed, the Crime Lab as a whole was producing errant ABO type AB results. Rather than finding the cause for this problem and developing a solution, Crime Lab serologists apparently believed it would be "safer"

---

127 Lab number L89-04795.

128 Lab number L87-06353.

not to report ABO type AB findings altogether.[129] In the absence of specific documentary evidence establishing the reason for the widespread failure to report the presence of ABO type AB, or witnesses in a position to explain it, we are left to speculate on the most likely explanations.

One of the few cases we reviewed in which a Crime Lab serologist reported finding ABO type AB in evidence is the case related to incarcerated defendant Timothy Offord.[130] In this sexual assault case analyzed by Mr. Bolding in November 1990, he reported that "Timothy Offord was determined to be a Type 'AB' Lewis secretor." Mr. Bolding also reported that a semen stain on the victim's underwear "contained Type 'AB' secretor activity" and, therefore, concluded that "we are not able to eliminate Mr. Offord as a possible semen donor to the panty sample." It appears that the fact that, based on analysis of a clean known reference sample, the suspect in this case was ABO type AB gave Mr. Bolding the confidence to report finding ABO type AB on a piece of evidence, where his more typical practice was to report the result as inconclusive.[131]

c. Failure to Provide the Statistical Significance of Inclusions in Blood Typing Cases

None of the serology reports we reviewed contained a statement regarding the statistical significance of an ABO typing result in which a suspect was reported to have been a potential contributor to the evidentiary sample. Typically, the serology reports we reviewed contain as conclusions statements, such as "the defendant cannot be eliminated as the source of the human bloodstain" or "the defendant is included in the group of possible donors of the semen stain," without any explanation of the significance of such conclusions. While such conclusions, where supported by appropriate testing, may be technically accurate, they have the potential to be misleading when not accompanied by appropriate statistics. Mr. Krueger told us that, during his brief stint performing serology in the early 1980s, he was specifically instructed not to include any discussion of the statistical significance of his ABO typing

---

129 This avoidance approach also is apparent in the Crime Lab's failure to take advantage of electrophoretic testing of enzymes and proteins, as discussed above. The Crime Lab never mastered the electrophoretic techniques; instead, the Lab serologists decided to forgo this extremely valuable tool altogether.

130 Lab number L90-10291.

131 Another case in which Mr. Bolding reported finding ABO type AB in an evidence sample is that of Dwight Riser, which we discuss further below. In that case, Mr. Bolding appears to have falsified his ABO typing results obtained from an evidence sample in order to report finding ABO type AB activity, which happened to match the ABO type of Mr. Riser.

results in his reports and that such information was to be presented only during trial testimony.

As discussed above, ABO blood typing is used to associate or disassociate a suspect with biological evidence related to a crime. Although probative, ABO blood typing (unlike modern DNA testing techniques) is not discriminating enough to develop individualized genetic profiles. At best, it can only provide information about the statistical probability that a suspect (or victim) could have contributed to a biological sample related to a crime.

The frequencies of the four nominal blood types -- A, B, AB, and O -- in the general population of the United States are reflected in the table below:[132]

O	A	B	AB
43-45%	40-42%	10-12%	3-5%

Thus, for example, the potential donors of an ABO type A blood sample (with no other genetic information about the sample) are any ABO type A individuals, who constitute approximately 40-42% of the general population.

To fully understand the probative value of serological evidence, several critical questions about bloodstains and body fluid stains must be answered. Such questions include:

- What is the size of the relevant pool of possible donors of the biological stain evidence in a particular case?
- Could the bloodstain, semen stain, or saliva stain have originated from the suspect or victim, or are they scientifically excluded as the source of that evidence based on their blood type?
- If the stains consist of a mixture of body fluids from more than one person, are there any factors present that are foreign to the victim that might include or exclude the suspect?

---

132 The distribution of blood type frequencies can vary depending on demographic factors of the population for which the frequencies are presented, such as race, ethnicity, and geographical location. The distribution reflected in the above chart is for the general population of the United States as reported at http://www.aabb.org/All_About_Blood/FAQs/aabb_faqs.htm by the American Association of Blood Banks.

- If the suspect is included as a possible source of the stain evidence, what percentage of the relevant population might also have been the source of the stain?

Without the forensic serologist providing answers to those critically relevant questions in a lab report, it is difficult, if not impossible, for participants in the criminal justice system to assign the appropriate weight to the serology evidence.

Moreover, while the forensic serologist must provide, when necessary, answers to these questions to the judge and jury in the form of courtroom testimony, it is equally important for written laboratory reports to explain the significance of results in clear, unambiguous language, including the proper use of statistics. There are two overlapping reasons that a laboratory report should always contain an explanation of the statistical significance of inculpatory genetic marker test results, such as ABO type. First, laboratory reports often are stipulated to in criminal proceedings, and, therefore, the written laboratory report must accurately and fully address the significance of genetic marker test results in the absence of testimony by the forensic serologist or by a defense expert. Second, a defendant and his counsel must receive sufficient information to understand the significance of the genetic marker testing evidence.[133] In Harris County, where for various reasons defense counsel rarely had access to the worksheets, bench notes, and raw data underlying the conclusions stated in the Crime Lab reports, the need for the statistical significance of ABO results to be included in the police report supplements themselves cannot be overemphasized.

We have encountered several cases in which the Crime Lab's failure to report statistical frequencies resulted in gross overstatements of the significance of the Lab's ABO typing results. An illustrative example is a 1986 sexual assault case in which Ms. Kim identified the victim as a type A secretor and reported the suspect as a type O secretor. Ms. Kim found that stains on a vaginal swab and from the victim's underpants demonstrated type A and type O activity. Ms. Kim concluded that "[b]y these results it was not possible to eliminate the suspect as a possible semen donor." While technically accurate, Ms. Kim's conclusion was misleading because it was not accompanied by statistical probabilities explaining its insignificance. In fact, it is not uncommon for persons of ABO types A, B, or AB also to demonstrate type O activity. In light of this, no genetic markers foreign to the victim were detected on the vaginal

---

133 Unfortunately, in the 1980s and early 1990s, the Crime Lab was not alone among police agency laboratories in failing to consistently include statistics describing the significance of genetic marker test results. By the time of the first ASCLD/LAB accreditations in 1982, however, the trend among good forensic laboratories was toward inclusion of combined frequency of occurrence of genetic marker test results in the body of the written laboratory report.

swab or undergarments; therefore, no potential semen donor could properly be excluded. In other words, Ms. Kim's conclusion that the suspect could not be excluded as a potential semen donor applied with equal weight to virtually *100%* of semen donors in the male population.[134]

d. Misreporting of Results

We have reviewed a number of cases that contain major issues related to the misinterpretation of serology test results and the inaccurate recording and reporting of results. These errors include mistakes in transferring data from test run logbooks to worksheets and from worksheets to Crime Lab reports. These are the types of errors in interpretation, documentation, and presentation that would have been detected, and presumably corrected, if there had been an effective supervisory control and quality assurance system in the Serology Section. As discussed in our earlier reports, however, it is clear that neither Mr. Bolding nor anyone else routinely reviewed the work performed by the Serology Section in order to identify technical issues related to testing and interpretation of results or, for administrative purposes, to ensure that work performed was adequately and accurately documented. The cases discussed below are illustrative examples of the errors that went unchecked in the Crime Lab as a result of the absence of such supervisory and quality controls.

In the 1990 sexual assault case involving suspect Jose Luna, the victim reported that a man she later identified in a lineup as Mr. Luna broke into her motel room and raped her. Ms. Kim determined that the victim was an ABO type O secretor and that Mr. Luna was an ABO type O non-secretor, meaning that his ABO type is not expressed in his body fluids, such as semen. Ms. Kim performed ABO typing on various items of evidence, including a vaginal swab from the victim's sexual assault kit, two stains on the motel bed sheets, and a white towel. The chart below compares the results Ms. Kim obtained through ABO testing on these items of evidence, as reflected in her raw data logbook, with the results she recorded in her worksheets and with the results she reported in her December 3, 1990 Crime Lab report.

---

134 In the cases we have reviewed, the failure to provide statistical frequencies has tended to lead to misleading impressions regarding the significance of evidence that may be prejudicial to the suspect. However, we also have reviewed cases in which the Crime Lab's mantra that "the suspect cannot be eliminated as a possible donor" understated the probative weight of genetic marker evidence developed by the Lab. In one case, a combination of ABO and enzyme testing performed by Crime Lab analysts was very discriminating and would have indicated a potential donor pool of less than 10% of the male population, which constitutes a very powerful serology result. The failure to provide statistics in that case significantly understated the probative value of the Crime Lab's serology results.

Evidence Sample	Kim's Logbook[135]	Case Worksheet	December 3, 1990 Report
Vaginal Swab	A and O activity	Weak A activity	No activity
Sheet Stain #2	A and B activity	A activity	A activity
Sheet Stain #3	A and B activity	A activity	A activity
Towel	A activity	A and O activity	A and O activity

Ms. Kim's reporting of the vaginal swab as "no activity" is particularly troubling because the actual results recorded by Ms. Kim in her logbook are particularly probative with respect to the investigation of Mr. Luna. The ABO type A activity that the raw data shows Ms. Kim detected on the vaginal swab is foreign to the victim. Therefore, if the case involved only one possible semen donor (i.e., only one assailant and no recent consensual partners), then Mr. Luna would be excluded as a potential contributor to the sample on the vaginal swab since the assailant would be ABO type A.[136] Although this is clearly a case of misreporting the results of ABO testing, we cannot determine on the basis of currently available information whether the errors are the result of unintentional mistakes in recording the results reflected in raw data or, as appears more likely, selective reporting of serology results. At a minimum, however, HPD lacked an effective quality control regime to detect and correct the inaccurate reporting of results illustrated by the Luna case.[137]

In the 1989 sexual assault case involving suspect Roy Anthony Qualls, we observed another instance in which the reported ABO typing results were not consistent with the results reflected in the serologist's raw data notes. In his July 15, 1989 report, Mr. Bolding reported both the victim and Mr. Qualls as being ABO type A secretors. However, Mr. Bolding's July 6, 1989 raw data worksheet reflects that Mr. Qualls was an ABO type B secretor. Mr. Bolding also reported that "semen was detected on the vaginal swab and smear" from the sexual assault kit and that "the vaginal swab examined contained type 'A' grouping activity." This statement in the report also is contradicted by the typing results reflected on Mr. Bolding's raw data worksheets. The raw data shows that Mr. Bolding's AI test results relating to the

---

135 The results reflected in this column of the chart are our interpretation of the ABO agglutination intensities recorded by Ms. Kim in her raw data logbook.

136 If there were the possibility of more than one assailant or a recent consensual sexual partner, then Mr. Luna could not be eliminated by the ABO typing results related to the vaginal swab simply on the basis of his non-secretor status; however, he could not be the sole contributor of the semen detected on the evidence sample.

137 Mr. Luna pleaded guilty to burglary on May 1, 1991, and the original sexual assault charge against him was dismissed. He was sentenced to 12 years in prison.

vaginal swab were negative for ABO type A and type H [O][138] activity and that the results for type B activity were uninterpretable due to lysis (rupture of the cell wall) of the type B indicator cells. The bottom line is that Mr. Bolding's reported ABO typing results, which suggested a potential association between Mr. Qualls and genetic material on the vaginal swab, were unsupported and contradicted by his recorded ABO test results. In fact, the raw data demonstrates that the results of Mr. Bolding's ABO tests were inconclusive as to whether Mr. Qualls was a potential contributor to the semen sample on the vaginal swab.[139]

Finally, in the 1987 sexual assault case involving currently incarcerated defendant Gary Allen Richard,[140] we reviewed another troubling example in which Ms. Kim misreported the results of her serology testing. Ms. Kim's serology worksheet dated August 26, 1987 clearly reflects that she determined through Lewis testing that both the victim and Mr. Richard were secretors, which means that both the victim and Mr. Richard would be expected to express their ABO types in secretions such as vaginal fluid or semen. The same worksheet also reflects that Ms. Kim typed the victim as ABO type O and Mr. Richard as ABO type A. Even though Ms. Kim's Lewis typing results determined that both the victim and Mr. Richard were secretors, she failed to detect any ABO activity in semen stains on a rectal swab taken from the victim and on the victim's skirt. In a typewritten Crime Lab report dated August 24, 1987, Ms. Kim reported -- contrary to the results reflected on her serology worksheet -- that she had determined that both the victim and Mr. Richard were non-secretors.[141] Based apparently on her failure to detect ABO activity in the semen stains on the rectal swab and skirt samples, Ms. Kim disregarded her Lewis testing results and, without basis in documented testing, reported that neither the victim nor Mr. Richard were secretors.

---

138 There is no common human antibody against ABO type O blood cells. Therefore, in AI testing, serologists use an extract from gorse seeds, *Ulex Europeus*, to cause type O cells to agglutinate. The seed extract, called lectin, agglutinates the H antigen found on all ABO cells, but the agglutination occurs in much higher concentration in the presence of type O cells. Therefore, the reaction to lectin observed in AI testing indicates type H antigenic activity, from which ABO type O activity is inferred.

139 Mr. Qualls pleaded guilty to the lesser offense of assault and was sentenced to five months in prison.

140 Lab number L87-00797.

141 In this case, Ms. Kim prepared a typewritten Crime Lab report that was not entered into HPD's On-Line Offense ("OLO") reporting system. This is highly unusual because by 1987 it was the standard practice of Crime Lab analysts to enter their reports directly into the OLO system.

e. Improper Alteration of Results

We have identified three cases in which Mr. Bolding was involved in the wholly inappropriate and unethical alteration of bench notes reflecting the serology results obtained by either himself or another Crime Lab serologist. Each of these cases reflects a disturbing lack of integrity on the part of Mr. Bolding. Moreover, Mr. Bolding's conduct in connection with the case of currently incarcerated defendant Dwight Riser appears to constitute scientific fraud and perjury.

i. Serology in the Derrick Jackson Case

Forrest Henderson was a singer with the Houston Grand Opera. His friend, Richard Wrotenbury, was an elementary school music teacher and also participated in the Houston Grand Opera. After Mr. Wrotenbury failed to appear for work at the school on Monday, September 12, 1988, the manager of the building in which Mr. Henderson and Mr. Wrotenbury shared an apartment entered the apartment and discovered the men had been brutally murdered. Both men had been beaten and stabbed, and there were bloodstains throughout the apartment. Mr. Bolding accompanied HPD investigators to the crime scene and personally collected blood samples from the apartment in order to perform serological tests on the evidence.

According to entries in his worksheets, between September 15 and September 23, 1988, Mr. Bolding performed ABO genetic marker tests on over 30 blood samples taken from various spots at the crime scene. He also typed known reference samples from the victims and from Calvin Dorne, HPD's initial suspect in the killings. Mr. Bolding found that both of the victims were ABO type A and that Mr. Dorne was ABO type O. Mr. Bolding's worksheets from September 1988 indicate that he failed to observe any agglutination as a result of AE testing of 13 of the bloodstain samples.[142] The worksheets also reflect, however, that he was in fact able to obtain results indicating ABO type A activity, consistent with the ABO blood type of both Mr. Henderson and Mr. Wrotenbury, in certain samples taken from the bedrooms and bathroom in the

---

142 Mr. Bolding's reported failure to observe agglutination in 13 of the bloodstain samples he tested is suspect. In light of the quantity of bloodstain evidence in the apartment and the relative freshness of the stains when Mr. Bolding tested them, it seems highly unlikely that he would have failed to obtain interpretable results with respect to so many samples. Indeed, bloodstains on three of these items of evidence actually yielded results when subjected to RFLP testing eight years later, in 1996. Since RFLP testing requires a much larger and higher-quality sample to yield results than does ABO testing, we question whether the absence of agglutination recorded for these samples is either (a) a product of poor analytical technique on the part of Mr. Bolding or (b) an instance of drylabbing where Mr. Bolding may have recorded "no agg." without having actually performed ABO testing on the evidence.

apartment. In his Crime Lab report dated March 15, 1989, Mr. Bolding reported that he detected "type 'A' human blood" in these samples.

Mr. Bolding's September 20, 1988 worksheet also indicates that he obtained strong Lattes results indicating ABO type O in a sample taken from the "North Bedroom Door."[143] A separate AE test indicated ABO type B activity in this sample. In his March 15, 1989 Crime Lab report, Mr. Bolding correctly reported the combined Lattes and AE results for this sample as "inconclusive." Mr. Bolding's September 23, 1988 worksheet records that he also obtained an AE result indicating ABO type B activity on a "Swab of N. Bedroom Door." In the March 15, 1989 Crime Lab report, however, Mr. Bolding failed to report that he had found ABO type B activity in this swab sample from the north bedroom door in the apartment. Instead, Mr. Bolding reported that "human blood having inconclusive grouping activity was detected on samples from . . . bedroom door." The unreported ABO type B activity results that Mr. Bolding obtained from the swab sample taken from the apartment's north bedroom door were clearly probative because ABO type B was foreign to both of the victims and to HPD's initial suspect, Mr. Dorne.

HPD's investigation of the opera singers' killings went cold. A break in the case came in 1995 when the Harris County Sheriff's Department acquired the capability to use the Automated Fingerprint Identification System ("AFIS"), which enables law enforcement agencies to compare unknown latent fingerprints with a database of known prints. In April 1995, HPD submitted a latent fingerprint taken over six years earlier from Mr. Henderson and Mr. Wrotenbury's apartment to the Sheriff's Office to run through AFIS. Using AFIS, the Sheriff's Office obtained a match for the unknown fingerprint, and Derrick Leon Jackson was identified as a suspect in the killings of Mr. Henderson and Mr. Wrotenbury.

On April 26, 1995, HPD investigators submitted a blood sample taken from Mr. Jackson to the Crime Lab for analysis. Mr. Bolding analyzed the reference sample and determined that Mr. Jackson was ABO type B. At some point, Mr. Bolding revisited the ABO typing work he had performed over six years earlier. Without performing any additional ABO testing on the evidence samples and without dating his changes to the raw data worksheets, Mr. Bolding wrote the finding of "'B' act" on the September 20, 1988 and September 23, 1988 worksheets under the columns related to

---

143 Mr. Bolding's original worksheets from September 1988 do not assign identifying numbers to individual items of evidence. Rather, the worksheets identify individual items of evidence only by Mr. Bolding's descriptions of where the sample was taken from the apartment.

the two samples taken from the north bedroom door.[144] Mr. Bolding previously reported his results with respect to both of these samples as "inconclusive" in the March 15, 1989 Crime Lab report. On June 28, 1995, Mr. Bolding issued another Crime Lab report in which he stated: "Derrick Jackson was determined to have type 'B' blood" and "human blood having type 'B' activity was present on two samples taken from the north bedroom door."

In March 1998, Mr. Jackson was tried for capital murder in connection with the slayings of Mr. Henderson and Mr. Wrotenbury. On March 11, 1998, Mr. Bolding testified about his serology work. On cross-examination, there was the following exchange between Mr. Bolding and defense counsel regarding Mr. Bolding's ABO typing results related to samples from the north bedroom door:

> Q: But you did specifically say that in direct examination that you found Type B blood on the door, is that correct, on the north bedroom door?
>
> A: Yes, sir.
>
> Q: On your original report generated in 1988 –
>
> A. Yes, sir.
>
> Q: -- do you show that anywhere?
>
> A. No, sir, I don't.
>
> Q: So you took those samples -- and this report was generated at the time you evaluated those samples; is that correct?
>
> A: Yes, sir.
>
> Q: And, so, at the time you generated those samples, you were inconclusive about that; is that correct?

---

144 We have located copies of both the original worksheets prepared in September 1988 and the worksheets that were altered to include new conclusions about Mr. Bolding's original ABO testing results. The original worksheets were obtained from microfilmed archives of the Crime Lab file related to the serology work performed in 1988. The amended worksheets were found in the paper file related to the DNA analysis that was performed by the Crime Lab in 1996 after Mr. Jackson was identified as a suspect. The DNA analysis in Mr. Jackson's case is discussed in the DNA section of this report.

A: Yes, sir.

Q: So, now nine years later, you're saying Type B; is that correct?

A: The Type B activity is basically what I'm saying.[145]

Although Mr. Bolding testified about changing his conclusions with respect to his ABO typing results of the evidence samples taken from the north bedroom door, defense counsel did not question Mr. Bolding as to why he reported his original findings as "inconclusive" or the basis for his amended findings. Although we cannot draw any firm conclusions about Mr. Bolding's motivations based on the information currently available to us, the most obvious explanation is that Mr. Bolding decided not to report his original ABO typing result finding ABO type B activity in the swab sample from the north bedroom door because that result was not consistent with either the ABO types of the victims or Mr. Dorne, HPD's initial suspect. Rather than report his serology work suggesting that someone other than the victims or Mr. Dorne bled in the room, Mr. Bolding reported these findings as inconclusive. Over six years later, after Mr. Jackson was identified as the suspect in the killings and his blood ABO blood type was determined to be consistent with Mr. Bolding's earlier unreported findings, Mr. Bolding amended his worksheets and issued a supplemental report to reflect a consistency between the evidence and HPD's current suspect. This case is a troubling example of the head of the Crime Lab's Serology Section seemingly tailoring his reported results to fit with investigators' pre-existing expectations.[146] Mr. Bolding has not made himself available to answer questions about this case.

ii. p30 Testing in the Sexual Assault and Killing of Maria Estrada

Maria Estrada's lifeless and partially nude body was discovered behind a restaurant on April 16, 1992. A thin piece of white rope was tied tightly around her neck, and it appeared that she had been sexually assaulted. On April 20, 1992,

---

145 *Jackson* Tr., Vol. 23, at 181:15-182:11.

146 On March 12, 1998, Mr. Jackson was convicted of capital murder, and he is currently on death row. Our review does not question the reliability of Mr. Bolding's original serology tests that determined ABO type B activity to be present on the north bedroom door of the crime scene. Rather, the issues illustrated by this case are selective reporting by Mr. Bolding and his failure to disclose results that potentially exonerated HPD's initial suspect, Mr. Dorne, when Mr. Bolding originally obtained them.

investigators requested that the Crime Lab test swabs and smears taken from the victim for the presence of semen and to perform DNA testing, if possible.

Notebooks retained by the Crime Lab reflect that on April 24, 1992, Ms. Kim performed p30 testing for semen on the vaginal, oral, and anal swabs taken of the victim. Ms. Kim typically recorded the results of her p30 testing for semen in raw data notebooks into which she affixed the test cards themselves and handwrote her interpretation of the results reflected on the cards. In this case, Ms. Kim wrote "neg" as the result of her testing for all three swabs. The notebook reflects, however, that Mr. Bolding overruled Ms. Kim's interpretation with respect to the results of p30 testing of the oral swab. A line was drawn through Ms. Kim's "neg" notation regarding the oral swab and the words "pos read by JB" are written next to the entry. Our review of the original p30 test card in this case, which was taped onto the same page of the notebook on which Ms. Kim recorded her results, confirmed that no precipitin band formed in the well related to the p30 test on the vaginal swab and that, accordingly, Ms. Kim's original negative interpretation was the correct interpretation of the test.

On April 28, 1992, an officer reported that "during the last couple of days" investigators had been in contact with Ms. Kim about whether she found sperm present on any of the swabs submitted to the Crime Lab. According to the officer, "Ms. Kim advised us today that there was no sperm in the anus or vagina; but that it was possible that there was sperm on the mouth swabs. She said that she would have to do further tests to be sure and that she would not know anything for another day." Ms. Kim's p30 notebook reflects that the day before this report, on April 27, 1992, she re-ran p30 tests on the swabs, and again the p30 card for this round of testing showed that no precipitin band formed for any of the samples and that, therefore, the vaginal, anal, and oral swabs all should have been interpreted as negative for semen. With respect to the oral swab, however, Ms. Kim recorded "pos (JB)," indicating that Mr. Bolding had interpreted the results for the oral swab as positive, perhaps again overruling Ms. Kim. There is no evidence that a microscopic sperm search ever was conducted on a smear made of the oral swab. On June 4, 1992, Ms. Kim reported that "semen was detected on the oral swab" and that "no semen was detected on any of the other items analysed [sic]."

Without performing any other testing, such as a microscopic sperm search, Mr. Bolding was not justified in altering Ms. Kim's interpretation that p30 testing of the oral swab was negative for semen. The conclusion that the oral swab in this case was

positive for the presence of semen cannot be supported by the results of either of Ms. Kim's p30 test runs.[147]

iii. The Dwight H. Riser Case

Of the more than 1,000 serology cases we reviewed, one of the most troubling involves ABO typing work that Mr. Bolding performed in 1988 and about which he testified in the September 1988 trial of Mr. Riser on charges of aggravated sexual assault and aggravated kidnapping.[148] It appears that Mr. Bolding falsified the results of his ABO testing in this case and lied about his educational credentials while testifying during Mr. Riser's trial.

On July 30, 1987, the victim in this case reported to HPD that earlier in the day she had been kidnapped at gunpoint, taken to a house, and locked in a closet from which she managed to escape. The following afternoon, a rape kit examination was performed. That evening, the victim told an HPD sex crimes investigator that, while she was held captive, she had been sexually assaulted twice. On December 14, 1987, Mr. Riser was arrested in Ruston, Louisiana. On August 29, 1988, hair, saliva, and blood samples were taken from him. The following day, these known samples from Mr. Riser were submitted to the Crime Lab where they were analyzed, along with a vaginal swab from the victim's rape kit and known blood and saliva samples from the victim.[149]

Mr. Bolding's report, dated September 14, 1988, states he determined the victim to be an ABO type A secretor and Mr. Riser to be an ABO type AB secretor.[150]

---

147 As discussed above, false negative results for semen are not uncommon with p30 testing. This is the reason that one of the significant failings of the Crime Lab in performing serology was the failure to perform microscopic sperm searches in cases where p30 or AP presumptive tests produced negative results. Indeed, PCR-based DNA testing performed by Mr. Chu on a sample from the oral swab produced a sperm fraction result that appears to be foreign to the victim. Nevertheless, to the extent that the only documentation in this case supporting the Crime Lab's reported conclusion that sperm was detected on the oral swab are the results of Ms. Kim's p30 tests, Mr. Bolding was not justified in overruling Ms. Kim's interpretation of the results of those tests as negative.

148 *Texas v. Riser*, Cause Nos. 481105, 481106 (248th Dist. Ct. Harris County, Tx).

149 Mr. Bolding analyzed the blood and saliva samples. The hair samples were transferred to the Crime Lab's trace evidence examiner for examination.

150 The examination worksheet contained in the case file does not reflect any results of ABO typing on the victim's known blood sample. The worksheet reflects that AI testing performed by Mr. Bolding indicated type A activity on the known saliva sample taken from the victim.

According to the August 31, 1988 laboratory examination worksheet, Mr. Bolding used the AI method to obtain ABO typing results from the vaginal swab taken from the rape kit. AI is a "reverse" typing method; therefore, agglutination observed in the A, B, or H[151] test solution indicates an *absence* of that antigenic activity in the sample. Mr. Bolding initially recorded the results of the AI testing on the vaginal swab as follows:

A	B	H
--	+2	+3

These results indicate that Mr. Bolding initially observed strong agglutination with respect to the O factor and relatively intense agglutination in the B factor, which indicated *only* type A activity on the vaginal swab. These results are consistent with the blood activity of the victim, who was determined to be ABO type A secretor. Because Mr. Bolding's original test results failed to demonstrate the presence of any ABO factors foreign to the victim, *no* male semen donor can be eliminated as a possible source of the semen detected on the vaginal swab. As a result, the pool of potential donors in fact equals *100%* of male semen donors in the population.[152]

Mr. Bolding did not report his initial findings. In a handwritten note on the worksheet, Mr. Bolding states that the results he had originally obtained "changed after a 30 minute reading" and that agglutination he had originally observed in the B well disappeared. Mr. Bolding altered his original results to reflect the following observed agglutination in each of the ABO test wells:

A	B	H
--	--	+3

151 For reasons explained in footnote 8 of Appendix B, the H antigen has become synonymous with the O antigen in ABO testing.

152 If there were a detectable level of ABO activity in the semen and vaginal secretion mixture on the vaginal swab, then the absence of ABO type B activity on the swab would have to eliminate Mr. Riser as a possible donor to the mixture (in light of his status as a type AB secretor). However, because the ABO type A activity on the swab could have originated entirely from the victim, no male can properly be excluded. Therefore, without further information, Mr. Bolding's original ABO typing did not eliminate Mr. Riser, but the results simply were not probative as to whether Mr. Riser -- as opposed to any other male semen donor -- contributed to the sample on the vaginal swab.

Mr. Bolding's explanation that the agglutination he had originally observed in the B well disappeared "after a 30 minute reading" is scientifically unsupportable. The AI process begins with cells that are free in a solution and that begin to agglutinate in reaction to the presence of known ABO antibodies depending on the ABO antigenic activity present in the sample. The degree of agglutination present in any of the test wells can be expected only to either remain constant or increase over time. Agglutination *does not* reverse and return to a negative state, which is the change Mr. Bolding reported observing "after a 30 minute reading."

This is the first serology case we reviewed where the analytical results appear to have been altered without a reasonable explanation -- the problems we observed in other cases related to analytical errors or misinterpretation of results, but not, as here, to a clear and unsupported alteration of a result that was inconsistent with the analysts' recorded testing data. The worksheets in this case reflect that Mr. Bolding appears to have altered the results of his own ABO typing work in a scientifically unsupportable manner. The effect was to include the suspect in a very small pool of potential semen donors -- which Mr. Bolding testified at trial was comprised of only 2.5% of the male population. In fact, Mr. Bolding's original test results supported the finding of a pool of potential donors equaling *100%* of male semen donors in the population.

The significance of Mr. Bolding's scientifically unsupportable alteration to the AI results for the vaginal swab is that the changed results now indicate the presence of both type A and type B ABO activity -- which means that there is now ABO activity foreign to the victim (the ABO type B activity) which could be attributable to Mr. Riser (who was type AB). Mr. Bolding reported only his altered results, stating in the Crime Lab report dated September 14, 1988 that "[t]he vaginal swab contained types 'A' and 'B' secretor activities." Mr. Bolding concluded in the Crime Lab report only that "we cannot eliminate the suspect Riser," and he provided no statistics regarding the significance of his conclusion (i.e., the percentage of the population that, like Mr. Riser, cannot be excluded based on Mr. Bolding's ABO typing results).

On September 28, 1988, just a week after issuing his Crime Lab report containing the conclusion that Mr. Riser could not be eliminated, Mr. Bolding testified at the trial of Mr. Riser. According to the trial transcripts, Mr. Bolding testified under oath to his qualifications as a forensic scientist in the Crime Lab as follows:

> I have a BS degree an [sic] MS degree in biology and biochemistry from Texas Southern University. I have a Ph.D. in biochemistry from the University of Texas.[153]

Assuming the accuracy of the transcript, Mr. Bolding's testimony as to his educational background was false. According to the transcripts contained in his personnel file, Mr. Bolding received a B.S. degree in biology, with a minor in chemistry, from Texas Southern University in 1969 and an M.S. in biology from Texas Southern University in 1975.[154] He does not have a Ph.D. degree.[155]

Mr. Bolding's altered AI results never were discussed at Mr. Riser's trial. He testified that the Crime Lab found "semen on the vaginal swab and the vaginal smear from [the victim's] sexual assault kit" and that "[w]e found that the blood group activity in the semen sample also contained both A and B groupings."[156]

The Crime Lab report in this case, consistent with all of the serology Lab reports we have reviewed so far, did not contain any statistics regarding the significance of Mr. Bolding's conclusion that, due to the reported finding of both type A and type B ABO activity on the vaginal swab, "suspect Riser" could not be eliminated. At trial, however, he provided misleading testimony as to the significance of the inclusion of Mr. Riser based on his finding of type "A" and type "B" activity on the vaginal swab.

Mr. Bolding testified correctly that Mr. Riser's ABO type AB is present in only 5% of the human population,[157] but then he overstated the statistical significance of the inclusion of Mr. Riser as a potential contributor to the semen sample found to be present on the vaginal swab. Mr. Bolding narrowed the population that could have

---

153 *Riser* Tr. at 105:3-5 (Sept. 28, 1988).

154 Mr. Bolding told us that he was enrolled in a Ph.D. program at the University of Texas School for Biomedical Sciences for one year. He dropped out of the program in 1977 or 1978 because he was having difficulty with the course work.

155 In 2003, the District Attorney's Office investigated allegations that Mr. Bolding falsely testified that he had a Ph.D. during trial testimony in another case. According to Mr. Bolding's attorney, the District Attorney's Office reviewed transcripts from numerous cases in which Mr. Bolding testified before deciding not to charge him with misrepresenting his educational credentials in sworn testimony. We do not know whether Mr. Bolding's testimony in the trial of Mr. Riser was among the transcripts reviewed by the District Attorney's Office, but it seems unlikely given that Mr. Riser's trial happened 15 years before the investigation of Mr. Bolding.

156 *Riser* Tr. at 119:12-13 (Sept. 28, 1988).

157 *Id.* at 122:1-4.

contributed to the semen reportedly present on samples from the rape kit to the male half of the population having ABO type AB -- or 2.5% of the overall population -- and included Mr. Riser within the 2.5% of the population that could have contributed the semen present on the vaginal swab:

> Q: Can you then pinpoint what you found in the semen sample found in 2.5 percent of the people walking out there in Harris County? [sic]
>
> A: That's correct.
>
> Q: And it just so happens, does it not, Mr. Bolding, that the Defendant falls within that 2.5 percent?
>
> A: Yes, ma'am, he does.[158]

This testimony as to the probability that Mr. Riser contributed to the type A and type B ABO activity Mr. Bolding reported finding on the vaginal swab is misleading for two reasons. First, there is no support in the testimony or in the Crime Lab report for the assumption upon which the 2.5% statistic is premised -- namely, that the type A and type B activity Mr. Bolding reported as present on the vaginal swab is associated with seminal material present on the swab. Second, Mr. Bolding's 2.5% statistical figure assumes, without basis, that the type A and type B activity he found on the swab is attributable to a single donor with the ABO type AB. The 2.5% figure fails to account for the possibility that the ABO activity Mr. Bolding reports having detected on the vaginal swab was attributable to separate type A and type B donors (the victim, for example, was determined to be an ABO type A secretor and could have contributed to the ABO activity present on the vaginal swab). Mr. Bolding conceded on cross-examination that, for this reason, the population of potential contributors was greater than the 2.5% of the population he testified to on direct examination.[159]

At the conclusion of the trial, Mr. Riser was convicted of aggravated kidnapping and aggravated sexual assault. He was sentenced to 75 years in prison.[160] The Court of Appeals of the State of Texas affirmed Mr. Riser's convictions in November 1989.

---

158 *Id.* at 123:11-17.

159 *Id.* at 125:7-11.

160 Our discussion of the Riser case, as with all of the cases we address in this report, is limited only to our review of the forensic science work performed by the Crime Lab and, if available, the trial

Footnote continued

D. Conclusions and Recommendations

During the 1980s and early 1990s, the forensic serology work performed in the Crime Lab under Mr. Bolding fell far below the principles generally accepted in the forensic science community at the time. The Serology Section failed the criminal justice system in Harris County both in the work that it did and did not do.

The Crime Lab failed to perform genetic marker testing, such as ABO typing and enzyme testing, on evidence in hundreds of cases submitted to the Lab -- testing that could have generated probative information about the culpability of suspects who had been identified by HPD investigators.[161] Our review of 850 serology cases submitted to the Crime Lab between 1980 and 1992 -- each of which relate to a suspect who is currently incarcerated in a Texas prison -- found that there may be biological evidence in 274 -- i.e., one third -- of these cases that never was typed by the Lab. In another 139 cases, the Crime Lab performed ABO typing on the evidence, but never compared it to known reference samples from the victim and suspect, so the genetic marker data developed by the Lab was of no use. These 413 cases all involve evidence that, if properly analyzed using existing technology and compared to reference samples, could have been used either to help convict a suspect who was known to HPD or to help exonerate him. All of these cases relate to currently imprisoned defendants convicted of very serious crimes, such as murders and sexual assaults.

For the many reasons discussed in detail above, the serology work that the Crime Lab actually performed is generally unreliable. We found major issues calling into question the reliability of the serology work performed by the Crime Lab or the accuracy of the results it reported in 180 -- 21% -- of the serology cases we reviewed that relate to a currently incarcerated defendant. This is an extraordinarily high and extremely disturbing proportion of cases in which to find problems of this magnitude.

Based on the findings of our review of 850 serology cases processed by the Crime Lab between 1980 and 1992 and which relate to a defendant who currently is in prison, we make the following recommendations:

Footnote continued from previous page

testimony of Lab analysts. We have not reviewed and make no assessments with respect to other evidence in specific cases.

161 Our review of the Crime Lab's historical serology cases was limited to those cases from the 1980s and early 1990s that could be tied to a currently incarcerated prisoner. The total number of cases from this period in which the Crime Lab found biological stains in evidence and could have performed serological genetic marker analysis likely is in the thousands.

- HPD must determine whether evidence currently exists and can be located in the following categories of cases:

  (1) Cases (274) in which evidence was screened positively for blood or semen, but no ABO typing was performed;

  (2) Cases (139) in which the Crime Lab performed ABO typing on evidence samples, but no comparison to known reference samples was made;

  (3) Cases (6) in which DNA analysis performed contemporaneously by an outside laboratory failed to include the suspect; and

  (4) All cases (180) we identified as containing a major issue with the reliability of the Crime Lab's work or the accuracy of its reported results.

- The District Attorney's Office and HPD should notify every prisoner whose case falls into one of the above categories that the independent investigation has identified a potential issue with the forensic serology work performed by the Crime Lab in his case and that HPD is attempting to locate any biological evidence that may relate to the prisoner's case. The District Attorney's Office and HPD should keep each prisoner who receives such a notice apprised of the status of the Department's efforts to locate biological evidence related to his case.

- In cases in which HPD is successful in locating evidence containing potential biological samples, the District Attorney's Office should notify the prisoner of the existence of this evidence, advise him that it is possible that DNA testing could be performed on the evidence, and ask the prisoner whether he wants DNA analysis to be performed on the evidence.

  - In cases in which the prisoner requests DNA analysis, Harris County and HPD should arrange for the analysis to be performed without cost to the prisoner.

- Harris County and the City should appoint a special master to review the complete investigative, prosecutorial, appellate, and post-conviction *habeas* record for all 180 of the major issue serology cases we identified that relate to a currently incarcerated prisoner as well as the 6 cases in which DNA testing already performed did not include the prisoner as a potential contributor of the evidence. The purpose of this review should be to determine (1) what role, if any, work performed by the Crime Lab played in the defendant's conviction and (2) whether DNA analysis of evidence in the case should be performed in order

to substantiate the defendant's conviction, regardless of whether serology evidence processed by the Lab was used in the prosecution of the defendant.

- In cases in which the special master determines that DNA analysis should be performed to substantiate the conviction, Harris County and the City should arrange for the DNA analysis of evidence in the case without cost to the prisoner.

II. DNA (1993 – 2002)

We reviewed a total of 135 DNA cases analyzed by the Crime Lab between the early 1990s and December 2002, when the DNA Section of the Crime Lab was closed following an outside audit. We identified major issues in 43 -- or approximately 32% -- of these cases.[162] We reviewed all 18 of the death penalty cases that involved DNA analysis performed by the Crime Lab prior to the closure of the DNA Section. We identified major issues in the DNA analysis performed by the Crime Lab in four death penalty cases involving death row inmates Franklin Dwayne Alix, Juan Carlos Alvarez, Gilmar Alex Guevara, and Derrick Jackson.

Sixty-nine of the 135 DNA cases we reviewed were cases in which there had been a conviction and (as of December 2005) re-testing performed by outside laboratories had failed to confirm the original DNA results reported by the Crime Lab.[163] We identified major issues in 25 -- or 36% -- of these cases.[164]

---

162 There are 45 suspects or defendants involved in the 43 major issue DNA cases we identified. Each of these individuals is identified in Appendix E, "DNA Major Issue Cases."

163 In early 2003, the District Attorney's Office and HPD began a process designed to re-test all cases that resulted in a conviction -- whether at trial or through a guilty plea -- in which DNA evidence analyzed by the Crime Lab may have played a role. The central purpose of the re-testing program has been to identify any cases in which the results of DNA analysis performed by the Crime Lab cannot be confirmed. As of December 22, 2005, re-testing had been ordered for 416 cases.

164 As we discussed above with respect to our review of serology incarceration cases, our reviews of the Crime Lab's historical cases, including its DNA cases, focused only on the Lab's original technical work, the reporting of the Lab's results, and in certain cases the testimony by Lab analysts about their results in criminal proceedings. We did not review or consider other evidence, such as eyewitness testimony or confessions, that might have been available or introduced in these cases. We also make no assessment as to the likely guilt or innocence of any of the suspects or defendants, or the appropriateness of any punishment, discussed in our reports.

As with the serology work performed by the Crime Lab, we observed pervasive problems both with the quality of the Lab's historical forensic DNA testing and with the Lab's past practices with respect to the interpretation of its DNA testing results. It is not surprising that many of the significant and pervasive problems we have observed in the Crime Lab's serology work -- including failure to report probative results, poor technical work, lack of controls, absence of technical reviews, and poor documentation -- carried over into the Lab's DNA work after the DNA Section became operational in the early 1990s. Many of the same personnel who were involved with serology testing became the Crime Lab's DNA analysts. As discussed above, Mr. Bolding, the lead serologist in the Crime Lab, was instrumental in establishing the DNA capabilities of the Lab and was the head of the DNA Section from the time DNA analysis came online through the closure of the Section. The Crime Lab's history of poor training and inadequate supervision of its serology personnel continued into the DNA era. Indeed, the historical DNA Section never had competent technical leadership and was without a Criminalist III line supervisor from 1996 through 2002 when it was closed.

Although we observed a wide variety of serious problems with the Crime Lab's historical DNA profiling work, the following five problems were the most significant and pervasive:

- Failure to report typing results, including potentially exculpatory results.

- Prevalence of low quality analytical results, particularly with respect to PCR-based DQ Alpha, Polymarker, and D1S80 testing, likely attributable to a combination of poor technique on the part of the Crime Lab's DNA analysts and contamination.

- Failure to use and show proper regard for scientific controls, particularly negative controls in PCR testing, and failure to compare typing results at the redundant loci during the period when the DNA Section used the COfiler and Profiler Plus STR reagent kits to type the same evidence samples.

- Misleading reporting of the statistical significance of the Crime Lab's DNA profiling results, particularly in cases involving mixture evidence.

- Failure to perform and document meaningful technical and administrative reviews of the DNA analysts' work as well as the absence of a system assigning a unique identifier to track evidence samples from submission through analysis.

We discuss each of these serious problems with the Crime Lab's DNA work during the 1993-2002 period in detail below.

A. Background Regarding DNA Analysis

The nucleus of each of the 60 trillion nucleated cells in the human body contains strands of genetic material called chromosomes, along which a person's genes are arranged. Genes -- which are composed of molecules carrying the body's genetic information known as deoxyribonucleic acid (DNA) -- are the fundamental units of heredity and contain code for individual traits such as hair or eye color. The term allele refers to characteristics of a specific gene or a specific location on a DNA strand.

Most human DNA (99.9%) is the same for everyone. Therefore, because forensic scientists are interested in the individualization of samples containing DNA -- e.g., blood, semen, and saliva -- they focus only on the relatively few chromosomal locations -- loci -- that vary widely among individuals. Moreover, a DNA analyst only needs to examine enough loci to render negligible the statistical probability that two people could have the same DNA profile purely by chance in order to generate powerful results. Under current DNA standards in the United States, a DNA profile for an individual is generally considered to be one which consists of the alleles present at 13 specified chromosomal loci. Generally speaking, there is less than a 1 in 200 billion chance that two DNA profiles for unrelated persons consisting of alleles present at all 13 of these locations will be the same -- an extremely remote possibility given that the total population of the world is only about 6.6 billion persons.

The uniqueness and durability of DNA make it ideal for use by forensic scientists, and DNA profiling has many advantages over earlier conventional serology procedures. In addition to the immensely improved discriminatory power of DNA profiling, the DNA molecule itself is a particularly robust test target compared to the less stable genetic markers involved in serology. Another significant advantage of DNA testing is the ability to use a technique called differential extraction by which the sperm (male) components of a mixture can be separated from the epithelial (female) components. Differential extraction is, therefore, extremely useful in typing DNA evidence in sexual assault cases because it is frequently capable of producing two separate DNA extracts that can be used to produce profiles that represent the DNA types of the female and male contributors to a mixed sample.[165]

---

165 For ease of reference and to provide helpful background for the discussion of significant issues we have identified in the historical DNA work performed by the Crime Lab, we include in this section a brief general description of certain forms of DNA testing. For a more detailed

Footnote continued

The first step in DNA analysis is to determine whether a body fluid stain, potentially containing DNA, is present on the evidence items. Forensic scientists perform screening and confirmatory tests to determine what types of body fluids may be present. After a stain has been identified as blood or semen, several techniques may be used to extract DNA from the evidentiary sample. With mixed specimens, such as those typically found in sexual assault cases, a differential DNA extraction procedure is used to separate the "male" from the "female" components of the mixture. These different DNA components are then purified and typed separately from one another.

Restriction fragment length polymorphism ("RFLP") analysis was used in crime laboratories until the mid-1990s. The RFLP analysis process, while very discriminating, is time consuming and requires a relatively large amount of non-degraded, high molecular weight DNA.

DNA profiling technology made a major advance in the late 1980s with the development of a technique based on the polymerase chain reaction ("PCR"), which is an amplification process designed to copy or multiply specific segments of DNA. Development of the PCR process gave forensic scientists the ability to analyze much smaller quantities of DNA and made DNA profiling possible in some cases involving samples too small or too degraded for effective RFLP analysis. The early PCR-based DNA testing methods used in the Crime Lab were known as DQ Alpha, Polymarker, and D1S80.

The most common form of DNA typing used today is a form of PCR-based typing based on markers known as STRs ("short tandem repeats"). STRs are regions of human DNA that contain a series of short repeated units. The forensic science community in the United States has standardized DNA typing using a set of 13 core STR loci that have relatively high degrees of variation in the population as a whole. This set of 13 core STR loci is used for entry into the national DNA profiling database known as CODIS, which is managed by the FBI.

DNA profiles obtained from biological evidence samples can inculpate or exculpate an individual with a high degree of scientific certainty. The statistical meaning of comparisons between DNA profiles developed from known reference samples and the DNA profiles developed from evidence items must be properly calculated and reported in the laboratory reports prepared by DNA analysts. The true

---

Footnote continued from previous page

discussion of the technical aspects of DNA profiling, please refer to Appendix C of this report, "Discussion of DNA Profiling Testing Technology and Techniques Used by the Crime Lab."

significance of a DNA "match" cannot be properly conveyed without an appropriate estimate of how rare a specific profile is in the human population. Because the frequency of occurrence of the DNA profile conveys the probative weight of this evidence, it must be presented accurately and clearly by the DNA analyst in written reports as well as in court testimony.

B. Review of Historical DNA Cases

We originally drew our sample of DNA cases to be reviewed from cases analyzed in the Crime Lab from 1991 through the closure of the DNA Section in 2002. Similar to our experience when beginning our review of the Crime Lab's historical serology cases, we found that our original sample of historical DNA cases included a large number of cases that did not involve the performance of substantive analytical work and, therefore, would not provide a basis to assess the quality of DNA analysis performed historically in the Lab. In order to identify cases involving substantive genetic typing work, we developed a database of cases derived from raw data records retained by the Crime Lab; then, with the assistance of PwC, we modified our sample based on that database. Through this process, we identified a total of 1,288 substantive DNA cases, from which PwC developed a sample of 296 cases.[166] In the fall of 2005, we also began reviewing all 18 death penalty cases that involved DNA analysis and additional DNA cases that by then had not yet been confirmed through the post-conviction re-testing program.

By the time we issued our Fourth Report in January 2006, we had completed reviews of 67 DNA cases, including all 18 of the DNA death penalty cases except for the case of Derrick L. Jackson.[167] We identified major issues in 27 of these cases, or approximately 40% of the DNA cases we had reviewed to that point, including in three death penalty cases.[168]

---

166 As described in the Phase II Plan, the original sample size PwC developed for DNA cases (which was derived from a population including both substantive and administrative cases) totaled 358 DNA cases.

167 We were unable to complete our review of the Derrick Leon Jackson death penalty case prior to issuance of our Fourth Report because the original RFLP autorads related to that case were missing from the Crime Lab's raw data records. On February 3, 2006, the Crime Lab produced a recently-discovered box containing, among other things, case notes, raw data materials such as RFLP autorads and DQ Alpha test strips, and tubes of DNA extracts. The missing autorads related to the Derrick Leon Jackson case were in the box.

168 The three death penalty cases involving major issues that we discussed in our Fourth Report relate to death row inmates Franklin Dewayne Alix, Juan Carlos Alvarez, and Gilmar Alex Guevara. In our Fifth Report, we discussed the Crime Lab's work in a fourth major issue DNA

Footnote continued

In light of the gravity of the major issues identified through our case reviews during the fall of 2005, we recommended to the Stakeholders Committee and to HPD that we focus the review of the Crime Lab's historical DNA cases on the 69 DNA re-test cases which, as of that time, either (a) had not yet been tested by outside laboratories or (b) failed to be confirmed through re-testing by outside laboratories. We did so because it was clear that those cases pose the greatest risk for potential injustice and because our completed reviews of over 60 cases already found such a high proportion of deeply flawed cases that continuing with the originally selected sample made little sense -- we had already learned that the error rate was unacceptably high. In December 2005, the Stakeholders Committee and HPD approved our recommendations, and we changed the focus of our DNA case reviews accordingly.

By April 2006, we completed our review of all 69 of these DNA conviction cases in which either the evidence had yet to be re-tested or the Crime Lab's original DNA results had not been confirmed through re-testing. In total, we reviewed 135 DNA cases analyzed by the Crime Lab from the entire period before December 2002 in which the Lab performed DNA analysis. We identified major issues in 43 -- or approximately 32% -- of these cases.[169]

C. Serious Problems Identified in the DNA Cases

Virtually every historical DNA case we reviewed reflected technical, administrative, or reporting deficiencies that would have been unacceptable in a properly managed forensic DNA laboratory during the 1990s and early 2000s. Although many of these cases involve technical or interpretive errors by individual analysts, the most significant and troubling problems in the historical DNA Section were systemic. The head of the DNA Section, Mr. Bolding, had no experience performing DNA analysis and, as revealed by the 2002 DPS audit, lacked the educational and technical credentials to be a DNA technical leader under the FBI's DNA Advisory Board ("DAB") guidelines. The historical DNA Section never had a competent Criminalist III line supervisor, and, between 1996 and 2002, that position was vacant. HPD's DNA analysts were poorly trained, guided by woefully inadequate and

---

Footnote continued from previous page

death penalty case, that of Derrick Leon Jackson. As discussed above, we also identified major issues with the reporting of serology results in the Derrick Leon Jackson case.

169 It is important to note that, because we adjusted our review to focus on cases that had not been confirmed through re-testing, our review of DNA cases was not based exclusively on a statistically-based sampling methodology. Therefore, this rate of occurrence of major issues cannot be extrapolated to the set of all DNA cases analyzed by the Crime Lab.

disorganized SOPs, and isolated from the better practices of other forensic DNA laboratories. Until 2002, the DNA Section was never subject to an outside inspection. In December 2002, the DPS audit highlighted myriad bad practices that had their roots in the Crime Lab's serology era and resulted in the Section's closure.

While many cases processed by the historical DNA Section were not "wrong" -- in fact, the alleles detected and reported by HPD's analysts were real alleles, as confirmed by re-testing -- the bad practices described below created an environment in which serious and prejudicial errors in casework were virtually inevitable. Even those historical cases that do not contain major issues causing us to question the reliability of the DNA analysis or the accuracy of the reported results were produced in an atmosphere that was neither rigorously scientific nor scrupulously professional.

The problems we observed in the historical DNA cases are not attributable to individual rogue analysts who departed from the Crime Lab's approved practices. On the contrary, the widespread and serious deficiencies in the historical Crime Lab were consistent with the Crime Lab's accepted and understood practices. Thus, responsibility for the serious and pervasive problems with the historical DNA cases rests squarely with leadership failures that can be traced across the entire management structure over the Crime Lab, including (1) Mr. Bolding in the DNA/Serology Section, (2) Mr. Krueger, the director of the Lab, and (3) the Department's command staff overseeing the Lab.

1. Failure to Report Potentially Exculpatory Results

During our review of the Crime Lab's historical serology work, we found a disturbing number of instances where serologists appeared to be unwilling to report typing results that were inconsistent with the known ABO type of either a victim or a suspect. This indefensible practice continued into the DNA era since many of the same criminalists who had been serologists, including Mr. Bolding and Ms. Kim, became the Crime Lab's senior DNA personnel. With the adoption of DNA typing, the Crime Lab's practice of failing to report probative -- and in some cases potentially exculpatory -- DNA typing results became even more egregious.

As with serology, it appears that this pattern and practice of avoiding the reporting of DNA typing results that were not consistent with a victim or known suspect is attributable to the DNA analysts' lack of confidence (perhaps justified) in their ability to obtain reliable results. It is apparent that DNA analysts in many cases tended toward reporting only those results that, from their perspective, were "safe" in the sense that they were consistent with other evidence in the case or with the investigators' expectations. Far from being the deviant practice of a few unethical analysts, however, such selective reporting was an accepted practice in the historical

DNA Section under Mr. Bolding and appeared to have its roots in the Crime Lab's serology work.

DNA analysts' reluctance to report results that did not include the known profile of the victim or of a suspect is illustrated by three cases -- Franklin Dwayne Alix, Garland Davis, and Michael Mingo -- in which the Crime Lab failed to report potentially exculpatory RFLP results in favor of reporting less definitive and less powerful PCR-based typing results that appeared to reflect an association between the suspect and the evidence in the case.[170] In each of these cases, RFLP testing failed to detect the suspect's profile in some key items of evidence. Based on the RFLP results, the analysts in these cases failed to exclude these suspects as a source of the DNA.

Although very powerful and discriminating, Crime Lab analysts understood RFLP testing to be less "sensitive" than PCR testing and believed that RFLP testing could be missing alleles present in the sample that might be detected through the PCR amplification process. Accordingly, the analysts mischaracterized their completely valid RFLP results as "inconclusive" and performed PCR testing. Because of a combination of poor technique, failure to exercise appropriate controls, and contamination, the Crime Lab's PCR testing frequently produced an abundance of alleles -- some real, some artifacts from the DNA amplification process -- from which an association with the suspect could be interpreted. In these cases, analysts chose to report these less reliable, and in some cases highly questionable, PCR results that included the suspect while burying their RFLP results. When such selective reporting was coupled with the Crime Lab's systematic exaggeration of the statistical significance of these less discriminating PCR results, a very significant risk of injustice emerged.

Franklin Dewayne Alix. On August 26, 1998, Mr. Alix was convicted of capital murder for the killing of Eric Bridgeford. During the sentencing phase of Mr. Alix's trial, the State introduced evidence of other crimes attributed to him, including the murder of Gregorio Ramirez. In February 1998, Ms. Kim performed DNA testing on a piece of bloodstained "white gauze" after being told by an HPD investigator that he was "very positive that the blood on the gauze belongs to the suspect [Mr. Alix]." After performing PCR-based DQ Alpha, Polymarker, and D1S80 tests, Ms. Kim concluded that "the DNA patterns detected from the gauze are consistent with a mixture of DNA patterns from Gregorio Ramirez, Frank Alix and one other donor."[171]

---

170 We summarize each of these three cases below. More detailed discussions of the Alix, Davis, and Mingo cases appear in our Fourth Report at pages 35-41 and in our Fifth Report at pages 41-43.

171 Although Ms. Kim indicated on her worksheets that she ran both positive and negative controls in conjunction with her DQ Alpha, Polymarker, and D1S80 tests, photographs of the assays

Footnote continued

However, Crime Lab analyst Raynard Cockrell failed to report the DNA typing results obtained by RFLP testing performed on the same bloodstained gauze, which failed to show any connection between the evidence sample and Mr. Alix. The report issued by Ms. Kim states that "no DNA pattern was detected from the gauze" as a result of Mr. Cockrell's RFLP analysis. Our review of the original RFLP autoradiographs ("autorads"), contained in binders maintained by the Crime Lab separately from the paper Lab file, determined that, contrary to this statement in the Lab report, the RFLP tests Mr. Cockrell completed in March 1998 contained very clear typing results for the three reference and evidence samples. With the exception of one or possibly two faint extraneous bands on the autorads, all of the bands on the autorads pertaining to the gauze sample correspond with the bands associated with the victim's reference sample.[172] In sum, the Crime Lab failed to report (and, in fact, mischaracterized) the clearly probative, and potentially exculpatory, RFLP typing results it had obtained in favor of less reliable, but inculpatory, PCR-based results.[173]

Garland Davis. In this 1993 case related to a brutal gang rape of a woman, the Crime Lab performed both RFLP testing and DQ Alpha testing in order to assess whether Mr. Davis could be associated with semen detected on a rape kit vaginal swab, a rectal swab, and a stain located on the rear waistband of shorts worn by the victim.

Footnote continued from previous page

related to these tests do not reflect evidence of such negative controls. We reviewed photographs taken of the typing strips produced in other cases by Ms. Kim both before and after the testing in the Alix case. In all of the other cases, we found the negative control typing strips in the photographic record. The absence of photographic evidence that negative controls were in fact run calls into question the reliability of Ms. Kim's test results.

172 While it is possible that these faint bands might indicate that Mr. Cockrell's RFLP testing detected the presence of one or two alleles consistent with Mr. Alix in the gauze DNA sample, a more likely explanation is that the faint bands reflect carryover resulting from poor RFLP technique. The RFLP autorads reflect that Mr. Cockrell placed the gauze sample and Mr. Alix's known reference sample immediately adjacent to each other in the gel without an empty lane separating the samples. This improper technique raises the possibility that DNA from Mr. Alix's reference sample carried over into the adjacent lane designated and occupied by the gauze DNA sample.

173 An outside laboratory re-tested the bloodstain found on the gauze. On November 5, 2003, the outside laboratory, which used contemporary STR profiling technology, reported only Mr. Ramirez's DNA profile in the gauze bloodstain and that "Franklin Alix . . . is excluded as a possible source of this DNA." A second re-test by another outside laboratory was performed on the unstained portion of the gauze under the theory that, if the suspect used the gauze as a mask during the killing of Mr. Ramirez, there might be contact DNA present in the unstained areas of the gauze. On December 30, 2004, the second outside laboratory reported that "there was an insufficient amount of DNA obtained from . . . scrapings of the gauze . . . to obtain a profile."

Similar to the Alix case, the Crime Lab obtained strong RFLP results on three probes run by Lab analyst Mary Childs-Henry. The first probe detected the same non-victim DNA profile in both the male fraction of the stain on the waistband of the victim's shorts and the male fraction of the stain on the vaginal swab, neither of which originated from Mr. Davis or a second suspect tested in this case. The second and third probes also excluded Mr. Davis and the second suspect as contributors to the male fraction on the vaginal swab. Even though the RFLP results from each of the probes were strong and clear and even though none of the three probes detected Mr. Davis's profile in the samples, the Crime Lab reported that the RFLP "results in this case are inconclusive because no conclusive patterns due to male (sperm) DNA could be developed."[174] Moreover, the Crime Lab failed to report the unknown non-victim pattern identified through RFLP testing on the male fraction of the vaginal swab and the sample from the victim's shorts.[175]

Also similar to the Alix case, while the Crime Lab failed to report its probative -- and potentially exculpatory -- RFLP results, it did report the results of DQ Alpha testing performed by DNA analyst Joseph Chu that found a DNA profile consistent with Mr. Davis on the male fraction of the vaginal swab. The Crime Lab report stated its DQ Alpha test conclusions as follows: "The DNA type detected on the vaginal swab does match the DNA from Garland Davis (based on more than one semen donor)." Because the victim also has the only DQ Alpha allele (1.2) that could be directly associated with Mr. Davis (and, therefore, the victim could have been the source of the 1.2 allele in the evidence sample), Mr. Chu's DQ Alpha results should not have been considered inculpatory.[176]

Michael Mingo. Mr. Mingo's case pertains to the investigation of a suspected sexual assault of a 12-year-old girl that occurred on December 30, 1996. In January 1998,

---

174 The meaning of the Crime Lab's stated explanation of the supposed inconclusive nature of the RFLP results -- "because no conclusive patternsdue to male (sperm) DNA could be developed" -- is unclear.

175 There is no indication that this unknown DNA profile ever was compared to known reference samples obtained from any of the other three men suspected of being involved in the sexual assault.

176 Re-testing of DNA evidence in the Davis case by an outside laboratory failed to confirm the Crime Lab's reported findings. In a report dated March 4, 2004, the outside laboratory reported that it had analyzed cuttings from several forensic evidence items, including a cutting from the rear of the victim's shorts near the waistband. Mr. Davis was excluded from all of the samples tested by the outside laboratory, including the victim's shorts. In addition, the outside laboratory developed a profile of the semen donor that was never compared with a known suspect profile. These findings are consistent with the Crime Lab's unreported RFLP results.

DNA analyst Raynard Cockrell performed RFLP testing on extracts taken from the vaginal swab included in the victim's sexual assault kit. He initially ran two RFLP probes. He exposed the first probe for two hours and then extended the exposure overnight, and he exposed the second probe for one and a half hours. Neither of these RFLP tests on the vaginal swab included a profile consistent with Mr. Mingo. A telephone log in the Crime Lab file reflects that, on January 21, 1998, Mr. Cockrell told a prosecutor in the District Attorney's Office that the "suspect could not be ruled out" and that "PCR analysis might be able to give a conclusive result." On January 23, 1998, Mr. Cockrell informed a second prosecutor that "her suspect could not be ruled out" and that "PCR analysis [is] needed." He also noted that "SUSPECT is in jail" and that the trial currently was scheduled for the following Monday.

On February 5, 1998, Mr. Cockrell ran a third RFLP probe on the extract from the vaginal swab. After relatively short exposure times of only two hours and then four hours, faint bands consistent with the victim's DNA profile were apparent on the RFLP autorad. Also visible on the autorad were two very faint bands suggesting the presence of a DNA profile that was consistent with neither the victim nor Mr. Mingo. In other words, this third autorad indicated a potential unknown contributor to the sample from the vaginal swab. In light of these faint results, the appropriate action would have been for Mr. Cockrell to subject the third probe to a longer exposure time in order to further develop this DNA profile related to an unknown suspect potentially present on the vaginal swab. Instead, Mr. Cockrell prematurely terminated the third probe, thus failing to permit these faint bands to develop.

On February 19, 1998, Mr. Cockrell and DNA analyst Joseph Chu advised the prosecutor that "RFLP results are inconclusive" and that Mr. Chu would perform PCR analysis. The results of Mr. Cockrell's RFLP testing, including the potentially exculpatory bands detected by the third RFLP probe suggesting the presence of the victim's and an unknown person's DNA profiles, were never reported.

Mr. Chu then performed PCR-based tests -- specifically, D1S80, Polymarker, and DQ Alpha tests -- on the evidence sample. In his February 26, 1998 report, Mr. Chu reported that "the DNA type detected on the vaginal swab matches the DNA type of Michael Mingo." Consistent with the DNA Section's flawed and misleading practice of reporting statistical calculations of the suspect's reference sample rather than the statistical calculations of the profile detected in the mixture sample, Mr. Chu reported that "the DNA type of Michael Mingo can be expected to occur in 1 out of 300,000 people among the American Black population."[177] We calculated the relevant frequency

---

[177] This statement by Mr. Chu is completely irrelevant to the significance of the association -- reported as a "match" -- between Mr. Mingo and the evidence based on Mr. Chu's PCR testing.

Footnote continued

estimate, based on Mr. Chu's PCR-based results, to be 1 in 1,022 in the African American population, 1 in 157 in the Caucasian population, and 1 in 135 in the Hispanic population.[178]

2. Poor Quality PCR Results

As discussed above, we were alarmed by the frequency with which the Crime Lab's PCR-based testing -- D1S80, Polymarker, and DQ Alpha -- generated multiple DNA profiles that were matched to a suspect and the victim, plus one or more unknown donors. The analysts' failure to recognize the potential problem of consistently obtaining multiple DNA profiles from evidence samples where there was no clear information that these samples were likely to be mixtures of body fluids from more than one person reflects a lack of critical thinking on the part of the Crime Lab's DNA staff and a lack of training on the nature of PCR-based analysis and its susceptibility to contamination.

It appears that at some point the Crime Lab became concerned about PCR contamination. In Mr. Bolding's files, we found a memorandum from Mr. Bolding dated March 2, 2001 and addressed to Mr. Chu, a prolific PCR analyst. In the memorandum Mr. Bolding wrote:

> ON [sic] February 21, 2001, we spoke about contamination in the PCR Process, I requested a [sic] documentation of the contamination and what steps you took to alleviate the problem. To date I have not received that document.
>
> The corrections for contamination problems, via formal document are due in my hands on Monday Mar. 5, 2001 by 10 a.m. This document should be in a form that can be presented to defense experts.

Footnote continued from previous page

The Crime Lab's consistent practice of including misleading statistical calculations in mixture cases is the most pervasive of the major issues we have identified in the Lab's DNA cases. This issue is discussed further below.

178 The outside laboratory that re-tested the vaginal swab in Mr. Mingo's case was able to develop a partial DNA profile. The outside laboratory calculated a frequency estimate of 1 in 59 for unrelated individuals in the African American population. The District Attorney's Office and HPD consider this to be a case in which the Crime Lab's original DNA typing results were "confirmed" by the outside laboratory.

Mr. Chu could not recall whether a specific incident or event gave rise to Mr. Bolding's directive that he document and address contamination problems related to the PCR process. Mr. Chu told us that he believed Mr. Bolding's memorandum related to concerns about contamination at the DNA extraction stage, before evidence was transferred to the DNA analysts for testing. He also could not recall what action, if any, he took in response to this memorandum. We have found no evidence of any response to Mr. Bolding's directive that contamination in the PCR process be investigated.

In addition to the issues with the PCR-based testing in the Alix, Davis, and Mingo cases discussed above, in this section we describe further the problems we observed in the PCR-based typing performed by the Crime Lab. We also highlight the Reginald Jackson case to illustrate the effects that a combination of poor analytical technique and possible contamination had on the Crime Lab's use of D1S80, a PCR-based test.

a. Unreliable Allelic Results and Interpretation in PCR Cases

We reviewed many cases in which PCR-based testing generated multiple DNA profiles which were matched to a suspect, a victim, and one or more unknown donors. The frequency with which the Crime Lab's PCR-based work showed an abundance of alleles implicating multiple donors raises significant concerns about the quality of the DNA work performed. This situation was exacerbated by the absence of a quality assurance system to detect and remedy technical problems.[179]

Critical features of both DQ Alpha and Polymarker are the inclusion of control dots appearing on the test strips (the "C" dot in the case of DQ Alpha, and the "S" dot in the case of Polymarker). A DNA analyst must be very cautious in interpreting any dots that appear fainter than the control dot on the test strip. Appropriate positive and negative controls must be run with each test, or the PCR test results may be invalid. Ms. Kim's PCR-based results in the Alix case -- which generated a profile consistent with multiple donors -- were not replicated by either the Crime Lab's RFLP testing or by the re-tests performed by an outside laboratory. Ms. Kim's typing results in the Alix

---

179 Although the cases we describe in this section involve the early forms of PCR-based testing -- DQ Alpha, Polymarker, and D1S80 -- we also have observed problems with analysts' technical proficiency and use of controls in RFLP and STR testing. For example, Dr. Sharma, a former Criminalist III supervisor in the DNA Section, had a reputation in the Crime Lab for being unable to obtain RFLP results, and we reviewed at least one case that confirmed Dr. Sharma's inability to obtain RFLP results even from a sample that contained a relatively large amount of high molecular weight DNA. Later in this section of the report, we discuss problems we identified in the DNA Section's failure to use the D3/D7 control in STR testing prior to the 2002 closure of the DNA function.

case are highly questionable due to the absence of evidence that she ran negative control strips in connection with her PCR-based tests.

We are concerned that the multitude of alleles that Crime Lab analysts often identified through their PCR testing might, in some cases, be attributable not only to poor techniques but also to possible contamination. Generally accepted forensic sciences principles applicable during this period required forensic laboratories to maintain a database of profiles of each member of the laboratory for every method employed by the laboratory in order to help detect contamination by lab analysts. At our request, the Crime Lab provided us with a list of employee DNA profiles. This list of profiles does not include typing information related to the Polymarker or D1S80 systems. We also have found no evidence that the Crime Lab staff used this information when reviewing DNA typing data as a check against possible contamination.

Finally, we found that the Crime Lab's DNA analysts rarely conducted re-testing of samples that produced questionable results. Rather than re-test such samples, the Crime Lab's analysts tended to ignore some questionable signal bands, dots, and peaks, while proceeding to interpret other similarly questionable signals as alleles possibly originating from multiple donors.[180] The ambiguity of the DNA analysts' results in mixture cases was hidden by the Crime Lab's practice of reporting probability statistics based on known reference samples rather than on mixture results, with the effect that weak DNA typing results were made to appear more discriminating than they were. As discussed later in this section, this practice grossly exaggerated the significance of the DNA profiles reported by the Crime Lab in 23 of the historical DNA cases we reviewed.

Below are two cases analyzed by the historical Crime Lab that illustrate the DNA Section's troubling tendency to detect and report multiple profiles through PCR testing.

Juan Carlos Alvarez. The DNA testing performed by Ms. Kim in connection with the capital case of Juan Carlos Alvarez is an example of the Crime Lab reporting conclusions based on weak results. In the Alvarez case, Ms. Kim performed DQ Alpha, Polymarker, and D1S80 testing on DNA extracted from separate bloodstains located on firearms evidence -- on the stock and on the barrel of a rifle and on a shotgun. The only reference samples that Ms. Kim ran were those of two victims, Jose Varel and Hugo

---

180 An example is the Davis case, discussed above, in which the Crime Lab reported that Mr. Davis matched the DNA type detected on a vaginal swab based solely on the presence of a 1.2 DQ Alpha allele that Mr. Davis had the misfortune of having in common with the victim.

Perez. No known suspect DNA reference sample was run. Ms. Kim reported that the "DNA patterns detected on the rifle and shot gun are consistent with those of [Jose Varel] and one other donor."[181] This mixture finding was based on Ms. Kim's decision to call the "C" allele of the GC locus in Polymarker for one evidence sample and the "24" allele of the D1S80 typing system for three of the evidence samples. Our review found that these allele calls were weakly supported and that Ms. Kim's decision to report a mixture containing the profiles of Mr. Varel and an unknown person was questionable. On April 8, 2003, the outside laboratory that re-tested samples extracted from the rifle and shotgun determined, through STR testing, that only Mr. Varel's DNA profile was present in the evidence sample.

Carlos Segura and Mark Zavala. In a 1998 homicide case involving three suspects -- Carlos Segura, Mark Zavala, and Francisco Zapata -- we observed Ms. Kim's flawed interpretation of PCR-based results in a mixture case. This case involved a stabbing in which blood was identified on a knife and on several samples from the crime scene, including a blood trail leading away from the victim's body. Ms. Kim performed PCR-based testing on the blood trail samples, a sample from the knife, reference samples from the three suspects, and a sample described as "white tissue/blue diaper" that appears to contain the victim's DNA profile.[182]

In her July 7, 1999 report, Ms. Kim stated that "[t]he DNA pattern from the blood trail samples . . . is consistent with that of Francisco Zapata." She also reported finding "[a] mixture of DNA type [sic] consistent with DNA type [sic] of Francisco Zapata, Carlos Segura, and Mark Zavala and the donor of the blood trail sample and white tissue/blue diaper was detected on the back handle, the bolster and handle of the knife." Ms. Kim reported finding four DNA profiles on the knife -- all three suspects and a fourth person whose profile is consistent with the DNA profile obtained from "white tissue/blue diaper" and who actually is the victim.

The raw data reflecting the results of Ms. Kim's PCR-based testing, and the results of her DQ Alpha testing in particular, strongly indicate that her interpretation of

---

181 Ms. Kim concluded that Mr. Perez's DNA profile was not present in any of the DNA samples extracted from stains on the rifle and the shotgun.

182 Ms. Kim's analysis in this case is further confused by the fact that there is no clear profiling data related to a reference sample from the victim. It appears that Ms. Kim was not able to obtain DNA typing results on the blood obtained from the victim's autopsy. However, the Crime Lab obtained results from the "white tissue/blue diaper" sample, which was labeled as "DNA extract from white tissue/blue diaper -- Moses Ayala [the victim]" when the sample was sent to an outside laboratory for DNA testing in 1999. This indicates that the "white tissue/blue diaper" sample contained the victim's DNA profile.

the DNA testing results to include all three suspects and a fourth profile (the victim) is flawed and misleading. Unfortunately, the suspects and victim share several common DQ Alpha and D1S80 alleles, which made difficult the elimination of a suspect as a possible contributor to the evidence on the knife sample. However, a reasonable interpretation of the raw DQ Alpha results would be consistent with a mixture of the victim and Mr. Zapata only. Such an interpretation certainly would be more reasonable than Ms. Kim's finding that all three suspects and the victim bled on the knife. At a minimum, Ms. Kim should have tabulated the allelic findings in her report and explained that she could not eliminate Mr. Zavala or Mr. Segura as potential contributors due to the common alleles they shared with either the victim or Mr. Zapata. Instead, she issued a report that was extremely muddled and confusing.

In 1999, the evidence in this case was sent to an outside laboratory for STR testing. In a report dated August 25, 1999, the outside laboratory concluded that "both [the victim] and Francisco Zapata are included as potential contributors to the stains on the knife and sheath. Both Carlos Segura and Mark Zavala are excluded as contributors to the stains on the knife and sheath."[183] These STR results are consistent with the raw data related to Ms. Kim's PCR-based testing. However, Ms. Kim interpreted and reported her data to include all three suspects as well as a fourth contributor, whom she failed to identify as the victim. Her interpretive error was exacerbated when she presented misleading frequency estimates, calculated based on the suspects' reference profiles, that suggested strong associations between Mr. Segura (1 in 11,300) and Mr. Zavala (1 in 758,000) and the DNA evidence from bloodstains on the knife.[184]

b. Contamination in D1S80 Testing

The D1S80 locus was attractive to forensic DNA analysts because it exhibits a very high degree of polymorphism, or variability in the size of the D1S80 fragments, between individuals. D1S80 typing tests involve electrophoresis of D1S80 products through a gel to determine the relative size of the D1S80 fragments in the DNA from evidence or reference samples. After the D1S80 product is loaded and run on the gel, the D1S80 allelic bands are visualized to produce a gel image similar in appearance to an RFLP autorad. Sizing ladders are run in the gel along with the evidence and known

---

183 On May 31, 2005, an outside laboratory involved in the DNA re-testing program similarly reported that the only known persons that could be included as contributors to any of the evidence in this case are the victim and Mr. Zapata. HPD has acknowledged that re-testing by an outside laboratory in this case has reversed the Crime Lab's original DNA typing results as to Mr. Segura and Mr. Zavala.

184 We calculated the frequency estimate, based on Ms. Kim's typing results for the bloodstains on the knife, to be 1 in 48 in the Hispanic population.

reference samples in order to permit the DNA analyst to interpret the allelic bands produced through the electrophoretic process. Each individual has a maximum of two alleles at the D1S80 locus (homozygous persons have only one type of allele at the locus). An individual's D1S80 type is expressed as the combination of these alleles. For example, one person might be typed for D1S80 as a type "18, 24" and another person as D1S80 type "22, 31."

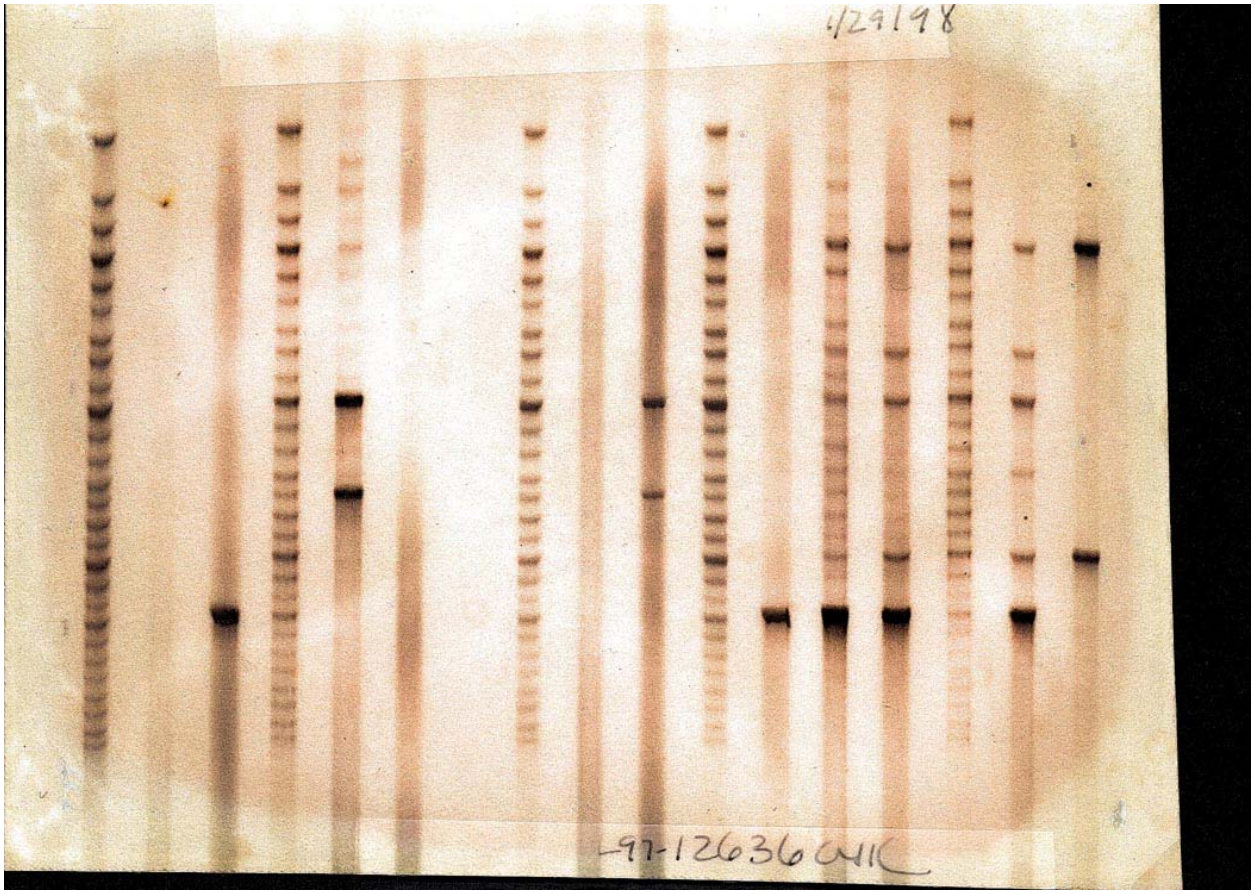
In the Reginald Jackson case, the Crime Lab was asked by investigators to analyze evidence related to a stabbing that occurred in 1997. Investigators submitted four items of evidence to the Crime Lab: (1) blood from a steak knife, (2) blood taken from a walkway in a parking lot, (3) blood from a foyer floor, and (4) a bloodstain from an article of clothing alternately described as "jeans" or "pants" in different Lab documents. The Crime Lab also received reference samples from the victim and the suspect, Mr. Jackson. Ms. Kim performed DQ Alpha, Polymarker, and D1S80 testing on the evidence and reference samples.[185]

Below is an image of the original D1S80 gel reflecting a set of results obtained by Ms. Kim in the Reginald Jackson case. Each sample lane is labeled to reflect the nature of the sample placed in the gel, such as evidence sample, sizing ladder, or control.

---

185 Ms. Kim's February 6, 1998 report indicates that "DNA extracted from the . . . evidence except for 4 microliters was transferred from Criminalist C. Kim to R. Cockrell for DNA (RFLP) analysis." Mr. Cockrell never reported any results related to the evidence in this case. A "Post-it" note attached to one of Mr. Cockrell's RFLP data sheets indicated: "No results on unknowns."

D1S80 Gel in the Reginald Jackson Case



The above gel image reflects that Ms. Kim obtained a strong homozygous D1S80 type 34 allele in the knife sample. This type 34 allele also is present in the foyer floor, walkway, and victim's reference samples. The walkway and victim's reference samples, however, also reflect the presence of numerous other alleles. The profile indicated for Mr. Jackson appears to be D1S80 type 24, 28 -- although several extraneous bands are apparent in his reference sample as well.[186] The unexplained presence of these extraneous alleles in both the victim's and suspect's reference samples illustrates

---

186 A 24, 28 profile is consistent with the profile developed for the jeans/pants evidence sample.

some of the problems we have observed generally with the Crime Lab's PCR-based DNA testing.

First, in addition to the type 34 allele, the victim's reference sample contains five other D1S80 type alleles: 18, 22, 24, 27, and 31. At most, an individual has only two alleles at a particular locus such as D1S80. The fact that Ms. Kim detected a total of six alleles in the victim's reference sample, which should be a pristine, single-source sample, is extremely troubling. This result indicates that the victim's reference sample was contaminated at some point in the handling of this sample. It is theoretically possible for a victim's reference sample to have become contaminated at the medical examiner's or coroner's office. In this case, however, subsequent to the D1S80 testing, Mr. Cockrell performed RFLP typing on the victim's reference sample and obtained a single donor profile. Moreover, the outside laboratory that later performed a DNA re-test was able to obtain a single donor profile for the victim's reference sample using the original DNA extract prepared in the Crime Lab. This suggests that, if the result reflected on the D1S80 gel for the victim's reference sample is the product of contamination, the contamination occurred after extraction, most likely at the PCR amplification stage.

It is possible that Ms. Kim added too much DNA from the evidence and reference samples during the PCR amplification phase of the testing process, which could have led to overamplification and the presence of multiple extraneous bands in the reference and evidence samples. When we asked Mr. Chu to discuss what he believed accounted for the extraneous alleles in several of the evidence and reference samples reflected on the Reginald Jackson gel, he mentioned overloading and overamplification. In light of the band pattern observed for the victim's reference sample, however, overloading or overamplification seem to be unlikely explanations for the multiple bands seen in the victim's reference sample.

Extraneous alleles also are visible in Reginald Jackson's reference sample and the walkway sample and could involve crossover or contamination from the allelic ladder. If the sizing ladder were overloaded in the gel, it is possible that it could carry over into an adjacent lane. In this case, however, while the Reginald Jackson reference sample was adjacent to an allelic ladder lane, the walkway sample was not. The walkway sample appears to be an example of mixing the allelic ladder with an evidence sample prior to loading it into the gel. Overloading and overamplification are other theoretical possibilities that could explain this "laddering" phenomenon when a specimen seems to exhibit all the bands just as an allelic ladder does.

Regardless of the cause of the serious problems with the D1S80 testing in this case, Ms. Kim was unable to resolve the issues. Ultimately, Ms. Kim only reported that "the DNA type detected from the knife is not consistent with that of Reginald Jackson."

Although the victim reference sample shared a strong type 34 allele with the knife sample, it appears *Ms. Kim was unwilling to interpret the mixed profile she obtained in the victim's reference sample*. Ironically, in several cases, including the Carlos Segura case discussed above, where the Crime Lab obtained questionable multiple profiles in evidence samples (as opposed to known reference samples), analysts either selectively reported profiles consistent with a suspect's or victim's known profile or reported out multiple profiles, including matches with known reference samples from the victim and suspect(s) as well as one or more "unknown" individuals. It appears that Ms. Kim was aware that reporting that multiple profiles were found in a reference sample (as could be the case with an evidence sample) would have been indefensible and extremely embarrassing, so she avoided reporting any result at all for the victim's reference sample in this case.

3. Problems With STR Testing

Errors by Crime Lab DNA analysts in the interpretation of raw data related to DNA tests were not limited to early PCR-based testing. Similar interpretive errors continued into the STR testing era. A critical control in the COfiler-Profiler Plus STR system historically used by the Crime Lab as confirmation that the alleles detected at the redundant D3 and D7 loci[187] in the COfiler and Profiler reagent kits are in concordance. We found several cases in which DNA analysts reported STR results and developed profiles despite discordance between the COfiler and Profiler Plus typing results at these redundant loci.

The presence of these redundant loci in the COfiler and Profiler reagent kits historically used by the Crime Lab for STR testing is a built-in quality control feature designed to detect possible sample mix-ups. This feature also is a tool to ensure that both kits are working properly. If the alleles detected with the COfiler reagent kit for D3, D7, and amelogenin markers are not in concordance with those detected using the Profiler Plus reagent kit, it is a warning that there is a problem, including the possibility that the sample is of poor quality. If the allele identifications at the redundant loci are not the same for the same samples, it is imperative that the problem be resolved by re-analyzing the original samples. The Crime Lab's historical SOPs specifically required that the D3 and D7 loci for the COfiler and Profiler Plus systems must agree in each sample run through the STR process.[188]

---

187 "D3" is shorthand for the D3S1358 locus, and "D7" is shorthand for the D7S820 locus.

188 The Crime Lab's SOPs, however, provide no guidance as to what procedures the DNA analyst should follow with respect to sample tests where the D3 and D7 loci are not in concordance.

We have identified several cases in which DNA analysts failed to take appropriate action to resolve potential problems with the accuracy and reliability of DNA typing results obtained from STR tests in which the D3 and D7 loci results generated from the COfiler and Profiler Plus reagent kits were not in concordance. Two such cases are the death penalty case of Gilmar A. Guevara[189] and the case of Ronald Cantrell.

Gilmar A. Guevara. The Guevara case relates to the June 2, 2000 murders of two convenience store clerks during an attempted robbery by suspects wearing masks. On June 10, 2000, Mr. Guevara was arrested, and police found blue and black ski masks and a Halloween mask in the trunk of his car. Mr. Chu performed STR testing on all three masks. In his Crime Lab report dated May 4, 2001, Mr. Chu reported that "a mixture of DNA consistent with Gilmar Guevara and [co-defendant] Jose Luis Hernandez was detected on the blue ski mask" and that "a mixture DNA type consistent with Jose Luis Hernandez and at least one unknown donor was detected on the black ski mask."[190]

Our review of the electropherograms contained in the Crime Lab file for this case found that, with respect to the STR testing on the blue ski mask, the alleles detected using COfiler and Profiler Plus reagent kits were in discordance at both the D3 and D7 loci. With respect to the black ski mask, the COfiler and Profiler Plus reagents were in discordance at the D3 locus. In light of these inconsistencies, the typing results obtained by Mr. Chu with respect to the blue and black ski masks should have been considered questionable or inconclusive, and the samples should have been re-tested.

On August 18, 2003, an outside laboratory reported that re-testing of the blue ski mask did not yield a DNA profile. On October 14, 2003, the same outside laboratory reported that DNA testing could not be performed on an extract from the black ski mask because there was an insufficient amount of remaining DNA extract. Thus, re-testing by an outside laboratory has not confirmed the Crime Lab's findings.

Ronald Cantrell. The case of Ronald Cantrell is another troubling example of questionable interpretation and reporting of STR results in the face of COfiler and Profiler Plus discordance at the redundant D3 and D7 loci. This case involved a reported sexual assault on an 8-year-old girl. According to the sexual assault examination form prepared on December 12, 2001, the victim reported that a suspect named "Ronny" forced her to perform oral sex, resulting in a "semen" stain on her

---

189 *Texas v. Guevara*, Cause No. 847121 (Harris County, Tx).

190 The Crime Lab found that DNA was present on the third mask -- a Halloween mask -- but it was not able to obtain any DNA typing results for the samples extracted from that mask.

shirt. On December 17, 2001, the Crime Lab received several articles of clothing from the victim, including a blouse.

On February 8, 2002, Crime Lab analyst Audrey Tims reported that "semen was detected on the blouse." Ms. Tims's identification of semen on the blouse is questionable. It does not appear that she performed a microscopic examination to detect the presence of sperm cells on the blouse. Ms. Tims's worksheet, dated December 17, 2001, reflects that the AP screening tests for semen were negative when she tested stains on the blouse. She also ran a p30 Abacard test for semen on the blouse, the results of which she recorded as "POS weak." Based on the limitations of the p30 Abacard test system, the negative AP test for semen, and the failure to perform a microscopic sperm search, this weak positive result probably was not a sufficient basis to support a finding that semen was present. Nevertheless, a differential extraction from the blouse's stain was performed, and the extracts were forwarded to Ms. Kim and Mr. Cockrell for DNA analysis.

Mr. Cockrell performed the STR analysis of the DNA extract from the blouse. On August 30, 2002, Mr. Cockrell reported that "[a] mixture of DNA types was detected on the blouse." He also reported that "[the victim], Ronald Cantrell, and at least two other donors are included in this mixture." Mr. Cockrell reported these results despite a clear discordance between COfiler and Profiler Plus typing results at the D3 and D7 loci. The following chart reflects alleles Mr. Cockrell obtained at the D3 and D7 loci as shown by his original STR electropherogram. The alleles in bold are those that appear on the electropherogram below the 150 rfu threshold necessary under the Crime Lab's SOPs in order for an allele to be interpreted as present in the sample.

Locus	Locus and Sample	COfiler	Profiler
D3	**Epithelial Fraction**	14, 15, 16, 17, 18	14, 15, 16, 17, 18
D3	**Sperm Fraction**	15, 18	15, **16**, 18
D7	**Epithelial Fraction**	**8**, 9, 10, 11, 12	10, 12
D7	**Sperm Fraction**	10, 12	**9**, **10**

As shown, there is general concordance of the typing results between COfiler and Profiler Plus at the D3 locus. Profiler Plus, despite being less sensitive than COfiler, detected a weak 16 allele in the sperm fraction, but it was below the 150 rfu threshold. There is, however, significant discordance of the typing results at the D7 locus. With respect to the epithelial fraction, COfiler results show the 9 and 11 alleles above the 150 rfu threshold and an 8 allele below the threshold that was not detected by Profiler Plus. Although this is a significant discordance, the slightly greater sensitivity of COfiler might explain the extra alleles detected by that system and does not necessarily

indicate that the control failed and the test must be disregarded. However, the discordance in the sperm fraction at the D7 locus cannot be explained by the greater sensitivity of COfiler. With respect to that sample, Profiler Plus detected weak 9 and 10 alleles, and COfiler (the more sensitive system) failed to detect the 9 allele at all. This discordance at the D7 locus cannot be reconciled and should have invalidated the results and caused Mr. Cockrell to re-perform the analysis.[191]

Re-testing by outside laboratories has failed to confirm the original results reported by Mr. Cockrell. HPD reported that the "raw evidence" stain on the victim's blouse had been consumed.[192] Therefore the re-testing laboratory had to use the DNA extracts prepared by the Crime Lab. A report issued by an outside laboratory on May 2, 2003 stated that "[a] mixture of male and female DNA profiles was obtained from the epithelial fraction of the extracted DNA from the blouse" and that "Ronald Cantrell is excluded as being a potential donor to the mixture." The outside laboratory reported that "[n]o DNA was obtained from the sperm fraction of the extracted DNA from the blouse." A review by the same outside laboratory of the Crime Lab's original testing in this case questioned whether any semen was present in the stain on the victim's blouse. The outside laboratory concluded that "the evidentiary value of an inclusion [of Mr. Cantrell is] extremely limited, and makes it impossible to accurately assess the statistical significance of the conclusion that the suspect could not be excluded from the mixture." After another round of re-testing, the outside laboratory issued a report dated March 30, 2006, stating that it had obtained a partial male profile from "the epithelial cell fraction of the cutting" from the victim's blouse and that "Ronald Cantrell cannot be excluded as the DNA donor to the epithelial cell fraction" of the blouse cutting.[193]

---

191 Also, there is no evidence that the Crime Lab ran a substrate control with respect to the stain on the blouse. A substrate control would have been helpful in determining whether the alleles detected by the STR tests pertained to the suspected semen stain or to substrate material on the blouse.

192 It is unclear what the size of the purported semen stain might have been because the Crime Lab file did not contain a description of the stain. Good laboratory practice calls for the routine retention of a portion of an evidence specimen to be properly preserved for possible additional testing in the future. Since the STR system is a sensitive test that requires only a small amount of DNA, it would be unnecessary and problematic to consume an entire specimen.

193 On August 19, 2002, Mr. Cantrell pleaded guilty to aggravated sexual assault and was sentenced to 6 years in prison.

4. Routine Misreporting of the Statistical Significance of DNA Profiling Results

The most pervasive major issue we found in our review of the Crime Lab's DNA cases during the 1993-2002 period was the routine and systemic misreporting of the statistical significances of "matches" reported by the Lab in cases involving evidence samples comprised of body fluid mixtures containing more than one DNA profile. Indeed, 23 of the 43 major issue DNA cases we have identified -- or approximately 53.5% of the major issue DNA cases -- involve reported statistics that are misleading because the Crime Lab calculated them based on the suspect's DNA profile obtained from a known reference sample, rather than on the profiles identified in the evidence sample.

The purpose of forensic DNA testing is to develop scientific information regarding the source of biological evidence recovered from crime scenes or from the victims of crimes. The role of the forensic DNA analyst is to answer the following questions: Could the biological evidence have originated from a particular suspect, or is he or she excluded as the donor of that evidence? If a particular suspect is included as a possible source of the evidence sample, how strong is the association between the suspect and the evidence?

Unlike serology testing, DNA testing is very discriminating and is capable of providing scientific evidence with a high degree of certainty that a particular individual is the source of an evidence sample. Forensic DNA analysts express the strength of the association of an individual with a specific sample of biological evidence through the calculation of a frequency estimate called a random match probability. That estimate quantifies the possibility that a person randomly drawn from the population could be the source of the genetic profile found in the evidence sample. The random match probability associated with an evidence sample can also be understood as the probability with which two unrelated people could share a series of DNA alleles. Probabilities of a random match at a single locus are combined to yield an estimate of the probability of a random match over an entire DNA profile. This estimate is interpreted as the probability that a person selected at random could have a DNA profile that matches the DNA profile obtained from biological evidence related to a suspected crime. Therefore, such random match probabilities are critical to understanding the significance of matching a suspect's DNA profile to the DNA profile of biological evidence.[194]

---

194 Because frequency estimates are central to understanding the significance of associations based on forensic DNA evidence, the "Quality Assurance Standards for Forensic DNA Testing

Footnote continued

DNA profiles developed from biological evidence samples may indicate that there is a single source for the evidence, that the evidence contains a mixture of DNA profiles contributed by more than one person, or that the evidence contains only a partial profile -- i.e., not all of the alleles necessary to develop a complete DNA profile for the evidence sample are present or detectable in it.

In cases where the evidence stain contains only a single DNA profile, the results of the DNA testing are somewhat easier to interpret and the calculation of the random match probability is relatively simple and straightforward. Evidence samples containing only a single DNA profile provide the most discriminating information about whether a particular individual could be the source of the biological evidence. In fact, random match probabilities from single source profiles often become so astronomically small -- e.g., only one in billions or even smaller -- that it becomes unreasonable to conceive that another person in the world could have this same profile. In these cases, the DNA testing data provide extremely powerful evidence that biological evidence at a crime scene could have come from only one person.

However, when a DNA profile contains DNA from more than one person or only reflects some of the DNA alleles (e.g., a partial DNA profile), it is much more difficult to provide compelling statistical evidence that a particular person's DNA was found in an evidence sample. Random match probabilities related to mixture or partial DNA profiles may result in frequency estimates that indicate that a relatively large proportion of the human population could have contributed to the biological evidence.

Therefore, it is critical that forensic DNA scientists provide an accurate and relevant frequency estimate when they discuss the interpretation and meaning of DNA evidence. A frequency estimate based on a DNA profile obtained from a suspect's known reference sample is completely irrelevant to the strength of the DNA evidence when the DNA profile is a mixture or a partial profile. If the frequency estimate of the suspect's known reference sample is presented, in a laboratory report or during testimony, juxtaposed with DNA typing information from a mixture or partial evidence profile, it can seriously overstate the strength of the evidence and be extremely misleading.

Footnote continued from previous page

Laboratories and Convicted Offender DNA Databasing Laboratories" issued by the FBI specifically require that technical leaders and analysts in DNA laboratories have specific education and training in statistics.

We have found that the Crime Lab virtually always calculated its reported frequency estimates based on the DNA profile developed from the suspect's known reference sample rather than from the DNA profile obtained from evidence samples, even in mixture and partial profile cases. It is clear that DNA analysts in the historical Crime Lab, including Mr. Bolding, did not fully understand the scientific basis of calculating frequency estimates from DNA profiles obtained from evidence samples and that they were not trained in the methods of properly calculating statistics associated with DNA mixture profiles and partial DNA profiles.

We prepared the chart below to demonstrate the sometimes exponential difference between the statistics reported by the Crime Lab and our calculation of the correct frequency estimates for the interpretable DNA typing results originally obtained by the Lab.[195] In many cases, the disparities are staggering.

---

195 The Crime Lab's convention, which was inappropriate, was to report only the statistics related to the racial group with which the suspect was identified. Properly reported frequency estimates include calculations for the three most significant ethnic populations in North America -- African American, Caucasian, and Hispanic. It is not appropriate in the calculation and reporting of random match probabilities to assume that a contributor to the evidence sample is from the same racial demographic as the suspect.

Comparison of Statistics Reported by the Crime Lab with Properly Calculated Frequency Estimates

Suspect's Name	HPD Reported Stats (1 in ___)	Recalculated Stats (1 in __)
Alix, Franklin	81,000	11
Boudreaux, Raymon	11,200	37
Carter, Harold[196]	9%	75%
Emory, Gregory	13,000	23
Guevara, Luis/Fernandez, Sixto[197]	663 million/61 trillion	5,900/9,100
Harris, Erskin	158,000	8 and 6
House, Dillard	2,773	83
Johnson, Arthur	11 million	113
Lawson, David	1.8 million	55
Lopez, Segundo	1.7 million	400
Meza, Alfredo	2.6 million	9
Pineda, Johnny	110,000	110
Napper, Laurence[198]	statistical match	232,000
Parra, Carlos	146,00	119
Rayson, Carl Lee	1.8 million	145
Segura, Carlos/Zavala, Mark[199]	11,300/758,000	48
Southern, Ronnie	6.3 million	30
Sutton, Josiah	694,000	14
Valdez, Richard	15,000	50
Vanzandt, Lonnie	15	2
Vaughn, Artice	988	42% (~1 in 2)
Ware, Marshall	2.9 million	22% (~1 in 5)
Washington, Dedrick	1,800	428

196 In this case, HPD presented its statistics in terms of the percentage of the relevant population that that could be expected to have a DNA profile in common with the suspect's reference sample. For the sake of comparison with HPD's presentation in this case, we have re-calculated the frequency estimate related to the evidence in terms of a percentage of the relevant population that could provide a random match.

This failure to properly calculate frequency estimates exacerbated the poor quality of the Crime Lab's technical work in developing DNA profiles from evidence samples. As discussed above, Crime Lab analysts often developed and reported DNA profiles reflecting multiple donors, which frequently were reported as including the victim, suspect, and one or more "unknown donors." As reflected in the above chart, the Crime Lab then went on to compound the prejudicial effect of these indiscriminate results by grossly exaggerating the significance of finding the suspect's DNA profile among the other DNA profiles in the evidence sample by calculating and reporting frequency estimates based on the suspect's known reference sample.

5. Poor Documentation and Technical Review

The Crime Lab's historical DNA case files contain no documentation reflecting that a supervisor in the DNA Section performed a technical review of the DNA analysts' work. This is a very disturbing and significant departure from the forensic science principles that were generally accepted during the 1990s and early 2000s. Until 1996 Dr. Sharma, who, based on our review of his casework, appears to have been technically incompetent, was the Criminalist III supervisor over the DNA Section. In 1996, Dr. Sharma was removed as the line supervisor over the DNA Section due to conflicts with Mr. Bolding. No one ever replaced Dr. Sharma as the Criminalist III supervisor for the DNA Section, which remained without a line supervisor through December 2002 when the DNA Section was closed. Although the then-head of the Crime Lab, Mr. Krueger, created a QA/QC position into which he moved Dr. Sharma around the time of the Lynn Jones debacle, Dr. Sharma did very little to fulfill his role as the quality control manager for the entire Lab.[200]

Footnote continued from previous page

197 The re-calculated frequency estimate for Sixto Fernandez is based on the results of a re-test performed by an outside laboratory, rather than on the original DNA profile developed by the Crime Lab.

198 The re-test performed by an outside laboratory of the evidence in the Napper case developed a partial suspect profile. The outside laboratory calculated a frequency estimate of 1 in 255 in the African American population based on that partial profile.

199 There is only one re-calculated frequency estimate in this case because the properly re-calculated frequency estimate is based on the DNA profiles developed in the mixed evidence sample, as opposed to HPD's method of calculating statistics based on the DNA profile developed from the individual suspect's known reference sample.

200 As discussed previously, Dr. Sharma made almost no meaningful contribution in the QA/QC position. By February 2001, Mr. Krueger had assigned Dr. Sharma to assist the Controlled Substances Section by analyzing marijuana cases.

This transfer left Mr. Bolding as the sole supervisor over both the DNA and Trace Evidence Sections. Mr. Bolding, who acted as the technical leader for the DNA Section, had never performed DNA analysis himself and did not possess the qualifications required under the FBI's DAB guidelines to be the Section's technical leader. Analysts who worked in the historical DNA Section told us that they would submit their case files to Mr. Bolding for review, but it was unclear to them whether he performed a technical review of their work. Mr. Krueger, the former head of the Crime Lab, told us that it was his understanding that DNA analysts reviewed each other's work and that Mr. Bolding made no attempt to re-interpret the DNA analysts' test data. The case files themselves contain no documentation reflecting that Mr. Bolding or any other supervisor performed such a review, and the DNA analysts with whom we have spoken did not recall receiving feedback from Mr. Bolding regarding the technical aspects of their casework. Moreover, in light of the pervasive problems we have identified related to the quality of the DNA Section's work, if Mr. Bolding did perform undocumented technical reviews of the cases analyzed by the DNA Section, such reviews were ineffective.[201]

It appears that administrative reviews -- i.e., reviews focused on the documentation contained in the case files and the organization of the Crime Lab files -- were performed occasionally in the DNA Section. Again, however, to the extent such reviews were conducted, they were not effective. For example, as with many serology cases, we have observed that, in DNA cases analyzed between 1993 and 2002, Crime Lab analysts failed to assign unique identification numbers to specimens extracted from items of evidence to establish with clarity the testing procedures that were performed and the results that were obtained with respect to which specimens. In one typical case, an evidence sample from a piece of clothing was referred to alternatively as "blue jacket" and "shirt." In this same case, several pairs of "jeans" were screened for the presence of DNA, but it was not clearly documented which pair of "jeans" evidence was actually tested.

Moreover, the Crime Lab's older DNA files generally do not contain drawings or descriptions specifying the location of critical biological stains on evidence submitted for analysis. The lack of information in laboratory notes to adequately describe the presence and location of important biological evidence is not generally accepted forensic science principle.

---

201 There certainly appears to have been an appetite among analysts in the historical DNA Section for technical assistance. We have seen documents from as early as August 1994 reflecting concerns among members of the DNA Section about the lack of standardized SOPs and training in PCR.

Finally, DNA analysts in the historical Crime Lab rarely prepared allelic tables charting the alleles that they identified through their DNA testing. This failure to prepare allelic tables is particularly problematic in STR cases with many items of evidence or where the STR electropherograms reflect a number of weak readings near or below the historical Crime Lab's 150 rfu threshold. Without an allelic chart, it is very difficult to discern which alleles the DNA analyst might have interpreted as being present in the sample and on which the analyst's conclusions were based.

D. The Post-Conviction DNA Re-Testing Program

In early 2003, following the closure of the DNA Section, the District Attorney's Office and HPD launched a re-testing program whose objective was to have an outside laboratory re-test all cases that had resulted in a conviction -- whether at trial or through a guilty plea -- in which DNA evidence analyzed by the historical Crime Lab may have played a role. The central purpose of the re-testing program has been to identify any cases in which the results of DNA analysis performed by the Crime Lab cannot be confirmed.

As of June 9, 2007, a total of 418 cases have been identified as candidates for re-testing. The District Attorney's Office withdrew four of these 418 cases from the re-test list because they ultimately were determined not to qualify for re-testing. Therefore, a total of 414 DNA cases originally analyzed by the historical Crime Lab have been identified for re-testing by outside laboratories.

HPD reports that, to date, the original DNA profiling results obtained by the historical Crime Lab have been confirmed in 362 of the 414 cases identified for re-testing. So far, testing by outside laboratories has conclusively contradicted the Crime Lab's originally reported DNA results in four cases in which no further re-testing will be performed.[202] However -- after more than four years -- the DNA re-testing process still remains open in 45 of these 414 cases.

1. Status of the DNA Re-Testing Program

The first step in the post-conviction re-testing process involved the identification by the Crime Lab of all of the cases in which some DNA testing was conducted by the Lab. By April 1, 2003, the Crime Lab had identified offense reports related to 1,322 such cases. The next step in the re-testing project was to match these 1,322 offense reports with "cause numbers" (i.e., court docket numbers) associated with prosecutions, which

---

202 The four "reversal" cases are those involving Josiah Sutton, Cory Ware, Michael Samuel, and the Segura-Zapata-Zavala case. The re-testing results in these cases are described further below.

are maintained by the District Attorney's Office. In the end, the 1,322 offense reports tied to just over 1,000 cause numbers.

The next step in the process involved prosecutors from the Harris County District Attorney's Office reviewing each of the cases associated with the over 1,000 cause numbers to determine whether the case was appropriate for re-testing. The guidelines provided to prosecutors for determining whether the DNA-related evidence in the case should be re-tested were as follows:

(1) Determine whether, if there was a trial, DNA evidence analyzed by the Crime Lab was introduced at trial. If it was, then the DNA evidence would be re-tested.

(2) If there was a trial and the DNA evidence analyzed by HPD was not introduced at trial, then the case would not be selected for re-testing.

(3) If there was a guilty plea and the case involved any DNA analysis performed by the Crime Lab, then the evidence was selected for re-testing.

HPD has been responsible for locating and sending the DNA evidence related to the 414 post-conviction re-test cases to one of the following three outside laboratories for re-testing: Identigene in Houston, ReliaGene Technologies, Inc. in New Orleans, and Orchid Cellmark in Dallas. HPD reports that, as of June 9, 2007, the re-testing process has been closed in 369 of the 414 cases. Although almost all of the 45 post-conviction re-test cases that remain open have been subject to at least one round of analysis, the District Attorney's Office has determined that either additional DNA testing or a review of the Crime Lab's paper case file should be performed in these cases.

For obvious reasons, the optimal evidence for re-testing purposes is raw evidence, such as stains on clothing or bedding or in sexual assault kits, that has not been processed by the Crime Lab. In cases where such raw evidence does not exist, the next best alternative is to test DNA that already had been extracted or otherwise undergone some form of processing by the Crime Lab. In cases in which there does not currently exist any biological evidence susceptible to DNA testing -- because the evidence cannot be located, or the biological evidence related to the case is now insufficient or too degraded to be tested -- the only remaining alternative is to perform a review of the Crime Lab's original paper case file.

Finally, the District Attorney's Office retained its own outside laboratory, Bode Technology Group of Springfield, Virginia, to review the analyses performed by the three laboratories originally involved in the post-conviction DNA re-testing program.

The District Attorney's Office advised us that the purpose of Bode's involvement was to serve as a second check on the cases and to assist the District Attorney's Office in reviewing the reports generated by the outside laboratories involved in the re-testing program.

The below chart reflects the status, as of June 9, 2007, of the 414 cases that the District Attorney's Office and HPD have identified to be included in the post-conviction DNA re-testing program[203]:

Status of the DNA Re-Test Program

Confirmed Re-Tests		
Confirmed with raw evidence	272	
Confirmed with extracts or processed evidence	81	
Confirmed through case review	1	
Confirmed with significant statistical differences	8	
Total Confirmed Re-Test Cases		**362**
Re-Tests In Progress		
Further DNA testing to be performed	6	
Case review pending	31	
Searching for additional evidence or reports	5	
First outside laboratory report pending	3	
Total Cases In Progress		**45**
Not Confirmed		
Original Crime Lab findings contradicted	4	
Not confirmed due to insufficient or degraded DNA	2	
Not confirmed; no additional testing ordered	1	
Total Cases Not Confirmed		**7**

The four cases in which re-testing performed by outside laboratories contradicted the original DNA results obtained by the Crime Lab are (1) the Josiah Sutton case; (2) the case involving suspects Carlos Segura, Mark Zavala, and Francisco Zapata; (3) the Cory Ware case; and (4) the Michael Samuel case.

Mr. Sutton's case in the only one in which faulty DNA analysis performed by the historical Crime Lab has been conclusively shown to have contributed to a wrongful

---

203 This chart reflects determinations made by the District Attorney's Office and HPD, not by the independent investigation.

conviction. Mr. Sutton was released from prison in March 2003 and pardoned by Governor Rick Perry on May 14, 2004.[204] As discussed above, testing by outside laboratories excluded Messrs. Segura and Zavala as possible contributors to the evidence in that case, although the re-tests confirmed the inclusion of Mr. Zapata as a possible contributor. The Crime Lab's original DNA work in the cases of Mr. Ware and Mr. Samuel excluded them as potential contributors to the biological evidence in their respective cases. However, re-testing performed by the outside laboratories contradicted the Crime Lab's original results by resulting in the *inclusion* of each of these defendants.

2. Review of Major Issue Cases That Have Yet To Be Confirmed Through Re-Testing

As of June 9, 2007, 45 of the 414 cases designated for re-testing remained unresolved, more than four years after the re-testing program started. HPD reports that 31 of these 45 cases will have to be evaluated on a paper review basis because, apparently, no DNA evidence remains to be re-tested. Two cases have been closed because the biological evidence in those cases either contains insufficient DNA or is too degraded to support testing.

As discussed above, in December 2005, with the approval of the Stakeholders Committee and HPD, we recalibrated our review of the Crime Lab's historical DNA cases to focus on those cases which, at that time, either had not yet been tested by an outside laboratory or the re-testing process had yet to confirm the Lab's original DNA results.[205] We completed our reviews of those cases, and, as reported above, we identified a number that contained major issues.

Based on our review of the Crime Lab's original DNA testing results in these "pending" re-test cases, we concluded that, with the exception of 15 cases, the re-retesting process could be discontinued, even though the outside laboratories had failed to confirm the Crime Lab's original DNA results, because (1) further re-testing of available evidence appeared to be unlikely to produce useful information and (2) the Lab's original DNA testing *data* appeared to be reliable, although the case may have involved significant reporting errors such as incorrect and misleading frequency estimates. In almost all of these cases, the Crime Lab originally performed STR testing,

---

204 The DNA work performed by the Crime Lab in Mr. Sutton's case is discussed in detail later in this report.

205 In December 2005, there were a total of 69 such cases.

which is more reliable and less susceptible to technical and interpretive errors than earlier forms of PCR-based DNA testing.

We performed another round of close technical reviews with respect to each of these remaining 15 "pending" re-test cases.[206] This round of reviews included review of the Crime Lab's paper case file, the results of re-testing performed by the outside laboratories, and HPD's original investigative file in order to assess the significance of the DNA evidence in each of these cases.

With the exception of two cases -- involving defendants Ronald Cantrell and Lonnie Van Zandt -- we have concluded that further re-testing is unlikely to produce information that would confirm or contradict the Crime Lab's DNA testing results and that, therefore, no further work should be done with respect to the remaining cases that HPD includes in the category of "re-tests in progress."[207] We recommend that the re-testing program be discontinued with respect to all of the "pending" re-test cases, except for the Cantrell and Van Zandt cases, both of which remain unresolved and both of which are very troubling.

Ronald Cantrell. We have discussed Mr. Cantrell's case in detail above. There is no solid information that semen ever was identified on the victim's blouse in this case. Several rounds of re-testing by outside laboratories have been unable to confirm the Crime Lab's original DNA results in this case, although Mr. Cantrell cannot be excluded as a potential contributor to a partial profile obtained from the epithelial fraction of a cutting from the victim's blouse. We recommend that HPD and the District Attorney's office continue considering DNA testing and analytical alternatives in this case. We understand that they are doing so.

---

206 The 15 "pending" re-test cases for which performed another round of detailed case reviews were Franklin Alix (L97-12163), Raymon Boudreaux (L97-00568), Harold Carter (L94-2461), Ronald Cantrell (L01-17322), Gilmar Guevara (L00-8053), Louis Guevara/Sixto Fernandez (L00-13216), Erskin Harris (L95-08229), Dillard House (L00-02780), Segundo Lopez (L97-12346), Michael Mingo (L97-13990), Ronnie Southern (L95-03891), Richard Valdez (L96-05919), Lonnie Van Zandt (L94-12745), Artice Vaughn (L94-11539), and Marshall Ware (L95-05151). In April 2007, after we identified these 15 cases as warranting further review, HPD reported that outside testing confirmed the Crime Lab's original results in the Harris and Mingo cases.

207 This observation also does not apply to the case of Leroy Lewis (L91-05760), which, although it did not involve DNA testing by the Crime Lab, is a major issue DNA case and is included on the DNA re-test list. In 1991, the case of Mr. Lewis and his co-defendant Robert J. Campbell was forwarded by the Crime Lab for DNA testing by an outside laboratory, SERI. The Lewis case is troubling, and it is described above in Section C.1 of our discussion regarding the Crime Lab's historical serology work. The Lewis case is among those that we recommend be reviewed by a special master to determine whether additional DNA testing would be appropriate.

Lonnie Van Zandt. In this 1994 male-on-male sexual assault case, the Crime Lab originally concluded that "DNA detected on the [victim's] underwear matches the DNA type of Lonnie R. Vanzandt [sic]." This conclusion was based on DQ Alpha testing that detected a single allele foreign to the victim in the epithelial cell fraction detected in a sample from the victim's underwear. The Crime Lab's Polymarker testing on the victim's underwear failed to detect any alleles foreign to the victim. We found that the Crime Lab's original DQ Alpha result was highly suspect, and the results of re-testing reported by ReliaGene on June 27, 2004 found only that "[t]he epithelial cell fraction of the DNA extracts from underwear . . . produced a profile consistent with the stain card [of the] complainant . . . ." In March 2007, the outside laboratory responsible for performing re-testing in this case confirmed that the victim's underwear was contaminated by the outside laboratory and, therefore, no DNA results were obtainable from the raw evidence. In light of the results obtained from the original extract tested by the Crime Lab, which detected only the victim's DNA profile, and the outside laboratory's contamination of the raw evidence, it is extremely unlikely that the Lab's DNA typing results could ever be confirmed in this case. If no further analytical work is possible, HPD and the District Attorney's Office should acknowledge that the Crime Lab's original DNA results could not be confirmed in this case.

E. Conclusion

As detailed above, the Crime Lab's historical DNA casework reflects a broad spectrum of serious problems ranging from poor documentation of the work performed to serious analytical and interpretive errors that resulted in highly questionable results being reported by the Lab. Indeed, we found major problems in over a third of the historical DNA cases we reviewed. Although we focus on the Crime Lab's work that led to problematic results and interpretations which had the potential to have led to a wrongful conviction, it is also clear that the Lab's failure to competently analyze and interpret evidence samples resulted unnecessarily in useless "inconclusive" reports that deprived the criminal justice system in Houston of valuable information which could have played an important role in the investigation and prosecution of an unknowable number of criminal cases.

Mr. Bolding's incompetence as the head of forensic serology in the Crime Lab carried over into the DNA operation, which he pushed to establish and then led from the early 1990s through its closure in December 2002. Many of the problems and practices that we found reflected in the Crime Lab's serology work -- including the absence of a quality assurance program, inadequately trained analysts, poor analytical technique, incorrect interpretations of data, characterizing results as "inconclusive" if they were not consistent with types from known reference samples, and lack of

meaningful and competent technical reviews -- are prevalent in the Crime Lab's DNA work as well. Furthermore, the potential for the Crime Lab's analysis of biological evidence to result in a miscarriage of justice was amplified exponentially by the general perception that associations between individuals and evidence generated by DNA analysis are nearly unique. The Crime Lab issued conclusions, frequently accompanied by inaccurate and misleading statistics, that often indicated a strength of association between a suspect and the evidence that simply was not supported by the analyst's actual DNA results.

And yet for a decade the Crime Lab continued to perform DNA work under conditions that made the risk of an injustice intolerably high. Although, as reflected by the results of the re-testing program, most of the DNA results reported by the Crime Lab have been confirmed in some fashion by independent testing, 52 cases have not been; and, after more than four years of re-testing, many of them probably cannot and will not be. While the number of proven wrongful convictions attributable to the Crime Lab's DNA work is small -- only one such case, that of Josiah Sutton, has been established at this point -- the possibility of other wrongful convictions resulting from DNA analysis during this era cannot be dispelled.

III. The Controlled Substances Section

In the context of a forensic laboratory, controlled substances are examined and analyzed in a number of different forms, including powder, cigarette, chunk, residue, liquid, and vegetative. Drug analysts also identify licit and illicit pharmaceutical products in tablet, capsule, and liquid form. In addition, controlled substances analysis may be conducted on pieces of evidence that may bear traces of controlled substances, including instruments and tools used in the drug trade and pieces of evidence on which traces of controlled substances may be found. Depending on the laws of a jurisdiction and the type of substance, analysts may also be called upon to determine the quantity and purity of a controlled substance, which can ultimately affect a defendant's sentence.

Drug analysts use a wide range of techniques and instruments to identify controlled substances, including color tests, microcrystalline tests, gas chromatography ("GC"), mass spectrometry ("MS"), infrared and ultraviolet spectrophotometry, and both microscopic and macroscopic examinations. A few of the many controlled substances that can be identified by such analyses include marijuana, Phencyclidine ("PCP"), heroin, codeine, methamphetamine, cocaine, and Gamma Hydroxybutyrate ("GHB").

Some tests used by drug analysts are simply screening tests that indicate the general type of drug being analyzed. For example, analysts use color tests to presumptively identify a drug by looking at a color change, which is the result of a

chemical reaction between the substance and an added reagent. Another presumptive identification testing method, chromatography, separates active ingredients within a drug mixture and provides a tentative identification of a drug. If an analyst uses a screening test to narrow the field of possible drugs and presumptively identify a substance, more testing is necessary to definitively determine the identity of the substance. For instance, an analyst can definitively identify marijuana by conducting a color test and then looking at the botanical features, such as cystolithic hairs, under a microscope.

On the other hand, certain tests can definitively identify the substance.[208] Mass spectrometry uses high-energy electrons to break an unknown substance into fragments and then measures and plots the masses of the small fragments. Mass spectrometry can provide a virtually definitive identification of a drug because the fragmentation pattern that is produced is unique for a vast majority of substances.[209] A second definitive drug identification technique is infrared spectrophotometry. An infrared spectrophotometer measures the wavelengths of infrared light that a particular substance absorbs and produces a spectrum that is unique for many substances.[210]

No matter which test or combination of tests is used, the governing principle behind controlled substances analysis is to compare the analytical results obtained from analyzing an unknown substance with the results obtained from known substances. For example, an infrared spectrum can be compared with the unique peaks on a spectrum of a known substance. Some laboratory instruments provide a library of

---

208 Under generally accepted forensic science principles, however, analysts use at least two techniques, based on different principles and two independent samplings, to determine the identity of a drug in a sample.

209 Another instrument commonly used in forensic labs is a gas chromatograph/mass spectrometer. In gas chromatography, the sample being analyzed is injected into a heated chamber and then carried by a constant stream of a carrier gas (usually nitrogen or helium). The carrier gas moves the sample into a column containing a thin film of liquid. In this column, the components of the sample move at different speeds and thus are separated and carried to a detector, which generates an electrical signal that is recorded as a series of peaks in graph format. The time it takes for a substance to travel from the injection point through the column is referred to as the substance's retention time. Analysts can identify the nature and quantity of substances in a sample by comparing retention times and column peaks on the chromatogram to those of known substances. Although gas chromatography alone is not a definitive test, a drug identification made by GC/MS testing can be definitive.

210 An analyst usually must purify the sample before infrared spectrophotometry analysis can be completed. One of the benefits of the combined GC/MS analysis is that a pure sample is not needed because gas chromatography separates the components of the mixture and mass spectrometry is then used to identify each component.

standards, which are analytical results of known substances. An analyst compares the results of the unknown sample with the standards in the reference library and decides whether there is sufficient similarity to determine that the unknown substance matches the known controlled substance.[211]

A. Reports of Drylabbing

In some of our early work interviewing Crime Lab employees in April and May 2005, we learned that two Controlled Substances Section analysts, Vipul Patel and James Price, had been accused of "drylabbing" several years before.[212] Supervisors in the Controlled Substances Section identified the suspect test results through their quality control efforts. For reasons that differed in each case, the alleged drylabbing incidents did not affect the outcome of any case or result in any improper convictions.

Each of the drylabbing incidents was detected by a Criminalist III supervisor in the Controlled Substances Section, and each resulted in an investigation by IAD. We selected statistical samples specifically targeting cases analyzed by Mr. Price and Mr. Patel. In fact, these episodes were common knowledge within the Crime Lab, although not well known outside the Lab. These incidents, in ways perhaps not obvious on the surface, highlight a number of important issues, including: the importance of line supervisors in performing quality assurance and quality control, the failure to adequately discipline Crime Lab analysts found to have been involved in misconduct, and the lack of support for imposing appropriate discipline on Lab personnel from the HPD command staff in place at the time.

1. Mr. Patel's Drylabbing Incidents

On December 20, 1999, while performing a routine case review, a Criminalist III supervisor determined that, on October 14, 1999, Mr. Patel had misidentified three tablets as Diazepam. The supervisor recognized that tablets with the same markings had been analyzed in the past and determined to be Clonazepam. The supervisor retrieved the evidence and, in the presence of a second Criminalist III, re-analyzed the tablets and confirmed that they were, in fact, Clonazepam and that Mr. Patel's

---

211 Some laboratory instruments conduct a library search and provide a list of results for the standard that most closely matches that of the unknown substance.

212 "Drylabbing" is the most egregious form of scientific misconduct that can occur in a forensic science laboratory -- it means the fabrication of scientific results. In the Crime Lab, the instances of drylabbing took the form of controlled substances analysts creating false documentation intended to reflect analytical procedures that were never performed. As one of the members of the Stakeholders Committee put it, drylabbing is a "hanging offense" in the scientific community.

identification of the tablets as Diazepam was false. The supervisors observed that the tablets had been scraped, as if they had been analyzed, but, because the analytical data supporting Mr. Patel's identification of the tablets as Diazepam could not have been generated through testing those tablets, they concluded that the test results obtained by Mr. Patel must have been falsified. After being confronted by all three of the Controlled Substances Section supervisors about the misidentification, Mr. Patel charged each of the supervisors with harassment.[213] Despite the supervisors' conviction that the incident involved deliberate falsification of test results, the only discipline Mr. Patel received as a result of this incident was a written reprimand, which was the same discipline issued to one of the supervisors based on the harassment charge.[214]

An IAD investigator contacted the Assistant District Attorney responsible for prosecuting the underlying criminal case. The Assistant District Attorney reported that Mr. Patel's erroneous identification did not meaningfully affect the case because the defendant was likely to accept a misdemeanor plea.[215] The misidentification was disclosed at the time of the plea, and the court pleadings were corrected appropriately.

The second incident involving Mr. Patel occurred on December 17, 1999 and was detected by the same Criminalist III supervisor in the Controlled Substances Section on January 10, 2000. During a routine review of Mr. Patel's case files, the supervisor discovered that a file contained identical Fourier Transform Infrared ("FTIR") spectra for two separate tablets.[216] The supervisor's suspicions were aroused because it is virtually impossible for tablets analyzed separately to produce identical spectra due to variances in drug concentration, the presence of excipient materials[217] in the sample, and minor instrument variability. The supervisor consulted with another Criminalist III supervisor and the Criminalist IV over the Controlled Substances Section, and they conducted an experiment demonstrating the extreme improbability of the FTIRs producing identical spectra, even from the same sample. At least one of the supervisors

---

213 During the meeting, a third Criminalist III supervisor commented that a person off of the street "with a brain the size of a peanut" would not make this mistake. The other supervisors reportedly chuckled at the comment. This formed the basis of Mr. Patel's harassment charges against the supervisors.

214 Mr. Patel told an internal investigator that, although he could not recall how he erroneously identified the tablets as Diazepam, the misidentification was the result of "human error" and was not intentional.

215 Both Diazepam and Clonazepam are Schedule IV drugs.

216 FTIR spectroscopy is a technique used to identify an unknown substance based on the absorption of a spectrum of infrared wavelengths by the substance.

217 An excipient is an inert or inactive substance used as a vehicle for a drug's active ingredients.

concluded that Mr. Patel tested one tablet and re-printed or copied that spectrum for the second tablet. Mr. Patel denied intentionally copying the printout and claimed that the FTIR instrument may have malfunctioned and printed the spectrum twice. A supervisor disputed Mr. Patel's hypothesis and told investigators that no one else in the Controlled Substances Section had ever reported such a problem with the FTIR instrument. Although the supervisor was convinced that this was a second incident of intentional scientific fraud on the part of Mr. Patel, he charged Mr. Patel only with poor judgment.[218] When we interviewed Mr. Patel about the two drylabbing incidents, we found his explanations utterly unconvincing.

Mr. Patel's punishment for this second drylabbing incident was a three-day suspension. Mr. Krueger also removed Mr. Patel from drug analysis and assigned him to CER. After some period of time in CER, Mr. Patel took advantage of Chief Bradford's open door policy to complain that he was overqualified for his assignment to CER and asked the Chief to take action to have him reinstated as a drug analyst. While neither Chief Bradford nor Mr. Krueger claims to recall any conversation about returning Mr. Patel to an analyst's role,[219] Mr. Patel was reinstated to the controlled substances bench a short time after his visit with the Chief. For his part, Mr. Patel had no doubt that Chief Bradford's intervention was the reason he was transferred back to the Controlled Substances Section. Neither HPD nor the Crime Lab performed a review of other cases handled by Mr. Patel to determine whether any of those cases were affected by similar misconduct.[220]

At the time of our Second Report, Mr. Patel remained an analyst in the Controlled Substances Section. The Crime Lab responded to our discussion of Mr. Patel's drylabbing incidents by once again taking him off the bench and reassigning him to CER. On June 13, 2005, the Public Safety and Homeland Security Committee of the Houston City Council passed a resolution calling for Mr. Patel's termination. That same day, Mr. Patel resigned from the Crime Lab.

---

218 The file maintained by the District Attorney's Office related to the underlying prosecution associated with this incident does not reflect that Mr. Patel's misidentification impacted the case. Apparently, the defendant never contested the charges against him and quickly entered into a cooperation agreement with the District Attorney's Office.

219 Although Chief Bradford said he does not recall speaking to Mr. Krueger about returning Mr. Patel to an analyst's role, he acknowledged that communicating with Mr. Krueger would "not be inconsistent" with actions he took in the wake of complaints brought to him.

220 In its statement issued in response to our Second Report, HPD acknowledged that, although the review of cases handled by Mr. Price had been performed, "for reasons unknown, the same was not done relative to Patel." HPD Press Statement, June 1, 2005.

2. Mr. Price's Drylabbing Incidents

The first of Mr. Price's drylabbing incidents was discovered by a Criminalist III Controlled Substances Section supervisor on May 12, 1998 during a routine review of Mr. Price's cases. The supervisor observed that Mr. Price had identified four tablets as the tranquilizer Flunitrazepam, a date rape drug the possession of which is a felony under Texas law. The supervisor recognized that tablets with similar markings had been identified by the Crime Lab in the past as Clonazepam, the possession of which was only a misdemeanor. A re-analysis of the tablets performed by the supervisor, confirmed that the tablets, in fact, were Clonazepam. The supervisor brought the issue to the attention of Mr. Krueger. The supervisor believed that the only way Mr. Price could have obtained the results he did was by analyzing a known sample of Flunitrazepam and representing the results as related to the substances in the case. Although Mr. Price denied intentionally testing a standard sample of Flunitrazepam, he had no explanation for the results he obtained. Mr. Price's error was caught relatively early in the underlying criminal proceedings, and the charge against the defendant was reduced to a misdemeanor.

Administrative charges of criminal activity/tampering with a government record, disobedience to laws, and lack of truthfulness against Mr. Price were sustained. On July 24, 1998, Mr. Krueger recommended that Mr. Price be suspended for ten days. The matter was referred to the District Attorney's Office as a potential criminal matter. By letter dated September 30, 1998, the District Attorney's Office declined to prosecute Mr. Price. On October 5, 1998, Chief Bradford suspended Mr. Price for only four days. Mr. Price's supervisor felt strongly that Mr. Price acted intentionally and that it was a "no-brainer" that he should have been terminated.

The second drylabbing incident involving Mr. Price was detected by the same Criminalist III supervisor two years later, on August 29, 2000. In this case, Mr. Price misreported the presence of a steroid, stanozolol, in a sample. During a routine check of one of the Crime Lab's GC/MS instruments, a Criminalist III supervisor discovered that Mr. Price had printed the test results obtained by another analyst, who had in fact detected stanozolol in a different sample, and then had inserted those results in his case file. The substance that Mr. Price had been assigned to test was re-analyzed and found to contain no controlled substance.

This incident also was referred to the District Attorney's Office, which on November 29, 2000 declined to bring charges against Mr. Price. Nevertheless, the Assistant District Attorney wrote that "[w]e hope that the declination of criminal charges will not serve as an endorsement of this chemist's behavior, which we find very disturbing." Because no stanozolol was present, the charges against the defendant had to be changed.

In a memorandum dated January 11, 2001, Mr. Krueger advised Chief Bradford that, at the request of the District Attorney's Office, the Crime Lab had reviewed all 574 cases Mr. Price had analyzed since June 2000. According to the memorandum, discrepancies were found in six cases, none of which affected charges against a defendant or the outcome of a criminal case. Mr. Krueger closed the memorandum by recommending that Mr. Price be terminated.

On February 21, 2001, Chief Bradford forwarded a memorandum to the City Attorney's Office indicating that he was considering an "indefinite suspension" of Mr. Price. On March 6, 2001, before any further action was taken, Mr. Price resigned from the Crime Lab.

In each of the drylabbing incidents involving Mr. Price and Mr. Patel, diligent Criminalist III line supervisors identified the problems and took swift and appropriate action. At least one of the supervisors believed strongly that both analysts should have been terminated immediately once the frauds were identified. As discussed in our Second Report, this supervisor was extremely frustrated when the system for investigating and disciplining personnel in the Crime Lab failed to produce those results.

Because of our reports regarding the alleged drylabbing incidents, HPD and the City asked us to expand the controlled substances historical case review to include a review of the work performed by Mr. Price and Mr. Patel. Those results are described below.

B. Controlled Substances Case Reviews

To assess the Section's historical work, we reviewed four separate sets of cases selected from the 1998-2004 period. Our first sample was comprised of 513 general Controlled Substances Section cases. Because of our reports regarding the alleged drylabbing incidents, HPD and the City requested separate reviews of the work performed by Mr. Price and Mr. Patel. We also reviewed a fourth set of cases, comprised of 50 files used to evaluate how the Crime Lab handled and analyzed cases involving large quantities of evidence (known as "bulk" or "bulky" cases). The case review plan took into consideration a number of factors, including the large number of cases, substances, and analysts involved in the Controlled Substances Section between 1998 and 2004. The sample of historical cases was adjusted at one point to include cases involving analyses that were more complex and challenging than the large number of basic marijuana and cocaine identifications typically completed by the Section.

Based on our review of the Controlled Substances Section's historical operations, we concluded that the analytical work performed on substances that are frequently

encountered in the Section, such as cocaine and marijuana, was generally of high quality. We also noted that the Section's work improved over time. However, we found that more analytical deficiencies were revealed when analysts examined more complex or less familiar substances. We also found a few pervasive and problematic practices that led to the identification of issues, mostly minor, in many cases. These issues were due to a combination of analyst errors and what was apparently a poor implementation of the review process and quality assurance program.

1. Major Issues Identified in the Crime Lab's Historical Controlled Substances Cases

In the four sets of historical cases described above, we identified a number of cases with major issues. We found major issues in 116 out of 513 controlled substances cases we reviewed, 18 of the 366 Patel cases reviewed, 11 of the 342 Price cases reviewed, and 2 of the 50 bulky cases reviewed. Over 110 major issue cases involved common, widespread problems that were directly related to poorly conceived and implemented laboratory practices. Relatively few of the major issue cases appeared to be the result of an individual analyst's mistake. In fact, two problematic Section-wide practices were behind the vast majority of cases we identified as containing major issues.

a. Problematic Section-Wide Practices

The first problematic historical practice was that the Crime Lab allowed analysts to report a finding based on a visual/physical identification when a definitive identification of the substance was not made through analytical testing. In over 70 cases that we reviewed, the Crime Lab allowed analysts to identify unknown tablets by physical comparison to a pharmaceutical reference source, such as the Physicians' Desk Reference, and report the result as if the identity had been confirmed through actual analytical testing. This practice would have been marginally acceptable if the wording in the reports noted that the items were identified only through physical comparison to a reference source, rather than through analytical testing. However, the scientifically accepted and best practice is to identify a substance through analytical testing because the surface physical appearance of a capsule or tablet can be deceiving, especially because such drugs are sometimes counterfeited.

The second widespread historical practice that we saw reflected in numerous cases was that analysts were permitted to report quantitative results even though quantitative analyses were not performed. For example, it apparently was customary practice in the Controlled Substances Section to presume that liquid codeine cough syrup would not have a concentration greater than 200 mg of codeine per 100 mL of liquid. Similarly, analysts also reported quantitative results for tablets based on the

quantitation given in a reference source after completing only a physical, and not an analytical, identification of the tablet. Again, at the very least, the analysts should have noted in their reports that the quantitative results were based on presumptions or reference sources, not analytical testing. Moreover, under generally accepted forensic science principles, the analysts should have done even more than merely clarify their reports; they should have instead performed analytical testing.

b. Mistakes by Individual Analysts and Inadequate Technical and Administrative Reviews

Unlike the issues described above, which could be attributed to analysts relying on and following deficient Crime Lab practices and policies, a smaller number of the cases we reviewed from the 1998-2004 period that we concluded had major issues appeared to be isolated incidents resulting from mistakes made by individual analysts when they failed to adhere to Lab policies and generally accepted forensic science principles. While the analysts themselves should be held responsible for the quality of their own work, the Section supervisors in place at the time were also responsible for ensuring the quality of the work completed by the Section. Examples include situations where analysts failed to report probative findings, reported a substance without a definitive identification, and identified a substance through the use of an inadequate standard.

c. Major Issues Identified in the Patel and Price Case Reviews

With the assistance of PwC, 366 cases handled by Mr. Patel and 342 cases handled by Mr. Price during the period of our historical review were selected for a targeted review because of the alleged drylabbing incidents. In the Patel sample, 18 major issues were identified, and, in the Price sample, 11 major issues were identified. For the most part, these were the same categories of major issues identified as Section-wide problems. However, we did identify another potential instance of drylabbing by Mr. Patel. In that 1999 case, Mr. Patel's report indicates that he conducted infrared testing on a tablet, but test printouts in the case file were so similar to one another that they can almost be superimposed on one another. This may indicate that the tablet was never tested and that a library standard, which can be generated by the testing equipment, was simply printed twice and inserted in the case file.[221]

---

221 This case is Lab No. 99-10884.

2. Minor Issues Identified in the Crime Lab's Historical Controlled Substances Cases

In addition to the major issues described above, our historical review of controlled substances cases worked between 1998 and 2004 identified hundreds of cases that involved minor issues. Most of those issues should have been detected through administrative or technical reviews. For example, in the past, controlled substances analysts frequently failed to follow the Crime Lab SOPs.[222] Most notably, analysts did not maintain case files that contained the required information, including the initials of analysts and reviewers.

One important SOP requirement that was not always followed relates to documenting modifications of reports. Under a well-established Crime Lab SOP, an analyst must retain three items in the case file if a report is modified after it has been approved: the original report, the modification notice, and the amended report. This SOP requirement must be satisfied because the computer program used by HPD and the Crime Lab, the On-line Offense ("OLO") reporting system, overwrites the original report whenever it is amended, making it impossible for one reading an amended report to know what, if any, changes were made.[223]

We also identified many historical cases with minor issues related to the failure to follow basic principles of laboratory documentation. The documentation in a case file should enable an independent reviewer to determine the processes analysts used when analyzing cases and reporting results. That was not the case in the vast majority of the over 200 cases we identified as containing minor issues. We found that Crime Lab analysts often incorrectly recorded case numbers and dates and failed to include documentation of the physical descriptions of evidence, instrument runs, sample preparation, and copies of the reference material pages used to make determinations.

Other minor problems we found in over half of the cases we classified as containing minor issues involved analysts not complying with generally accepted forensic science principles. For example, in some instances, analysts identified

---

222 However, we have noted that analysts often had to refer to other documents in the Crime Lab or rely on oral instructions and informal advice because, during the 1998-2004 period, the SOPs were not a well-organized central repository for the Controlled Substances Section's policies and procedures.

223 The use of the OLO system as the official Crime Lab reporting system is problematic for a number of reasons, including the above-mentioned overwriting of original reports and the fact that an analyst cannot change the date of a report, with the result that the amended report bears the same date as the original report.

controlled substances but ignored indications of the presence of other substances in the sample. At time, analysts also failed to conduct additional testing that was warranted and relied on inadequate instrument runs, poor instrument standards, and poor matches between the standard and the sample when reporting their results.

In our review of the controlled substances cases, we also saw numerous instances where analysts modified the submitting officer's description of evidence on the property record by making additions, deletions, or alterations to that description. Although we identified this as a minor issue, it is nonetheless a deviation from generally accepted forensic science principles.

Finally, our review of the Section's historical work identified another problematic practice relating to prolonged custody of evidence. In a number of cases, analysts retained custody of evidence for long periods, sometimes even months, after completing their analyses.[224] Under good forensic science principles, an analyst should return evidence promptly after testing is complete.

C. Conclusion

Our review of the Controlled Substances Section's historical work found a large number of cases with various major and minor issues. As discussed above, many of the major issues encountered in the Crime Lab's controlled substances cases were due to a few common, widespread problems related to poor laboratory practices. Most of the minor issues we identified are attributable to a combination of analyst errors, poor documentation practices, and an informal review process and quality assurance program that was not sufficiently rigorous. In spite of these issues, however, we found that the bulk of the actual analytical work performed in the historical Controlled Substances Section's -- which predominantly were cocaine and marijuana identification cases -- was reliable and of high quality.

---

224 We also have concerns regarding the Crime Lab's handling and labeling of controlled substances evidence. In particular, we noted difficulty tracking evidence in controlled substances cases involving more than one item of evidence. This difficulty stemmed from the fact that items were identified differently at each stage of the process -- on the officer's report, on the Crime Lab's worksheet, and on the Lab's supplemental report. We also noted concerns about HPD's general procedures for submitting evidence to the Crime Lab. These concerns and other issues and recommendations relating to CER, the Property Room, and evidence handling are addressed later in this report.

IV. The Firearms Section

The forensic examination of firearms evidence involves, among other things, microscopic bullet, fired cartridge casing, and shot shell comparisons. The Crime Lab's Firearms Section also currently performs test firings, trigger pull determinations, general rifling characteristics ("GRCs") searches, and muzzle-to-target distance determinations.[225]

The examinations required in firearms cases vary greatly depending on the types of evidence involved. Fired bullets, fired cartridge casings, and shot shells are examined with a comparison microscope, which enables the examiner to view side-by-side images of the ammunition components. Proper use of the comparison microscope requires a great deal of time, patience, and experience.

Markings on fired cartridge casings and shot shells may include firing pin and breech face impressions, as well as chamber, ejector, and extractor markings. Bullets are engraved with markings produced by the interior surfaces of the gun barrel. Markings on a bullet include GRCs, which are a pattern of "land" and "groove" impressions that can identify the possible make and model of the gun from which a bullet was fired. Other markings on a bullet are microscopic striations unique to the gun that fired it. Markings on cartridge casings, shot shells, and bullets can be extremely faint and require a careful, trained eye to locate and identify them.

The examinations described above can be used to make identifications (which involves matching ammunition components, such as fired bullets and cartridge casings, to the weapon that fired them), link different crimes committed with the same weapon, and provide other investigative leads.

A. Review of Historical Firearms Cases

We reviewed a total of 330 historical firearms cases covering the 1998-2004 period during Phase II of our investigation. With the cooperation of the Crime Lab and the Harris County District Attorney's Office, we obtained and re-examined evidence from several firearms cases in which the evidence was previously released to courts for use at trial.

Where documentation in the Crime Lab's historical case files was not sufficient to permit us to evaluate the reported conclusions, we re-examined the actual evidence

---

225 The Firearms Section also performed restorations of obliterated serial numbers until December 2006, when these examinations were transferred to the Trace Evidence Section to ease the caseload in the Firearms Section.

items to assess the original work performed. This was particularly necessary in comparison and identification cases because, before 2004, the Section's SOPs did not require examiners to adequately document (e.g., with photographs) the observations that formed the basis for their conclusions. Some of the historical cases we re-examined contained multiple bullets or cartridge casings and, thus, took considerable time to review. Other cases -- such as trigger pull examinations, serial number restorations, and test fires -- generally were reviewed based on the documentation contained in the Crime Lab file and, therefore, were less time consuming.

Most of the cases we reviewed were properly examined, adequately documented, and, with a few exceptions, reported in a timely manner by the Firearms Section. Overall, Firearms Section examiners demonstrated a high level of skill and diligence in performing their examinations and correctly making identifications. Their work was very good and, in some cases, truly impressive.[226]

We classified only one Firearms Section case from the 1998-2004 period as having a major issue. However, we identified minor issues in 146 of the 330 cases in our sample. Most of the minor issues were administrative in nature and involved slight deficiencies in documentation, deviations from Crime Lab policies, or deviations from what are now generally accepted forensic science principles.

B. Issues Identified in the Crime Lab's Historical Firearms Cases

We believe that many of the issues described below could have been discovered and rectified during thorough administrative and technical reviews.

1. Incorrect Case Report

The one case from the 1998-2004 period with a major issue was a 2002 case in which the Crime Lab issued a report that was not consistent with the examiner's work notes.[227] The examiner's notes indicated that, although the class characteristics of two bullets were the same, there were insufficient individual characteristics to conclude that the bullets had been fired from the same weapon. The report issued by the Crime Lab, however, stated that the two bullets had been fired from the same weapon. When we pointed out this inconsistency to the examiners involved, they readily agreed with our conclusion, issued a corrected report, and prepared an explanatory memorandum to the

---

226 One case examined by the Firearms Section that has been publicly questioned is the Crime Lab's work in the Nanon Williams matter. This case is the subject of one of our detailed case reviews later in this report.

227 This lone major issue case is Firearms Section case number 409-02.

Crime Lab's QA/QC Manager. All of this activity has been documented in the case file. There is also a note in the file indicating that the defendant in this case pleaded guilty; therefore, there was no testimony by the firearms examiner.

2. Documentation of Examinations

In 100 of the 330 historical cases we reviewed, the firearms examiners did not adequately document their work. These 100 cases included 61 in which the examiners did not adequately document in their work notes all aspects of the work performed during their examinations.[228] Adequate documentation includes both written notes and any images the examiner creates. The other 39 of the 100 cases of inadequate documentation involved issues observed in the final report prepared by the examiner. For example, although examiners generally summarized their work notes appropriately in the final report, we reviewed a number of cases in which this was not done.

Among the cases in which we found that the information that was documented in an examiner's notes was not included in the final report for the case were the following:

- In one case, the examination involved cross-comparisons with evidence from other cases. While the examiner's notes show an elimination (meaning that the evidence from a second case did not match that of the first), the elimination was not reflected in the lab report of the first case.
- In a second case, an identification was reflected in the examiner's notes but not included in the lab report.
- In a third case, an examiner identified two bullets to each other (meaning that the bullets could have been fired from the same weapon) but only listed a correspondence in GRCs in the lab report. This failure to include examination results in final reports may have caused the case investigators to use their time inefficiently.

In another case, we found that the final report contained different results from what the work notes would suggest. Even though the notes stated that the firearm's "feeding is difficult," the report stated that the firearm "functioned as designed." While

---

228 In one case we reviewed, the examiner was able to predict the type of weapon used based on GRCs but failed to include notes in the case file regarding the land and groove measurements. We confirmed that the reported results were correct, but we were concerned that we did not to find more detail in the examiner's notes

it is possible that initial difficulties with the firearm were resolved, there is nothing in the notes to document this.

Documentation errors can also appear in images generated by the examiner. In one case, we were unable to confirm a fired cartridge casing identification from the image contained in the file. We conferred with the examiner involved, who concurred that the images were of insufficient quality to allow a confirmation of the reported identification. Images must be adequate to demonstrate the basis of an identification, and this inadequacy should have been noted by the reviewer during the file review process.

In the 330 historical cases we reviewed, we found 38 instances in which examiners did not properly correct errors in their work notes. The generally accepted forensic science principle is now to mark through errors in work notes with the single stroke of a pen, write the correct information to the side, and initial the correction. In the historical cases we examined, we found instances in which an examiner used correction fluid or tape on the work notes, wrote on top of the error instead of to the side, or made a correction without initialing it. Without initials, one cannot determine whether the original examiner or a subsequent reviewer made the correction.

We found a handful of cases in which an examiner did not sign a copy of the final report.[229] We also noted instances in which an examiner did not include the case number or date of submission on the final report. In a few cases, the examiner listed the results of a search for weapon possibilities in his notes (also known as a "Criminalistics Laboratory Information System, or "CLIS" file search) but failed to include a listing of the search results in the final report.

3. Failure to Examine Components in the Chambers of Submitted Weapons

The Firearms Section's long-standing practice of not examining ammunition components that are contained in the chambers of submitted firearms also constitutes a departure from generally accepted forensic science principles. The practice apparently is based on the assumption that a fired cartridge casing or shot shell found in a submitted weapon must have been fired from that weapon. While typically this assumption is correct, failing to examine ammunition components in such instances prevents the Crime Lab from detecting staged events in which, for example,

---

229 In several historical cases, an examiner initialed only the worksheets in the case file that he or she generated, unlike other examiners who initialed every sheet in the case file. This administrative issue should be addressed by setting an agreed protocol as to which case file documents require an examiner's initials.

ammunition from another weapon is placed in a weapon at a crime scene. This possibility may appear remote, but most laboratories examine these cartridge casings and shot shells for markings that might help identify bullets fired from the same firearm. Although examining more fired cartridge casings and shot shells obviously requires the examiner to spend additional time on a case, doing so may lead to useful evidence and is consistent with sound generally accepted laboratory forensic science principles.

4. Delays in Reporting Results

We identified 13 cases that involved significant delays in reporting results of firearms examinations. We deemed delays significant where a considerable period of time passed between the submission of evidence and its examination, or between the examination of evidence and the issuance of a report, and there was no explanation or apparent reason for the delay. The Firearms Section's SOPs required that requests for analysis be performed in a "timely fashion," but these 13 case files had unexplained delays in reporting ranging from one month to over a year. In one case, fourteen months passed between the submission of the evidence and its examination and sixty more days passed before a report was issued. In another case, fourteen months passed from the completion of the examination until a report was issued. In a third case, eight months passed from the time the case was received until the issuance of the report. None of these case files documented a reason for the delay.

5. Technical and Administrative Reviews

Some firearms cases for the 1998-2004 period did not contain "date reviewed" or "reviewed by" entries, meaning that examiners may have reviewed their own examinations. While there is no evidence to suggest that a review was not performed by a second examiner, the lack of "date reviewed" or "reviewed by" documentation is a departure from generally accepted forensic science laboratory principles.

We also found many instances of minor oversights and typographical errors. Some oversights are understandable where repetitious phrases are used and where minor changes in wording may not seem important at first glance. For example, a sentence in one report discussed a "fired 9 mm Luger" instead of a "fired 9 mm Luger cartridge case." In another historical case, an examiner's notes stated that rifling was "consistent with polygonal rifling," while the report stated that it "exhibits polygonal rifling." It can be difficult to catch such omissions or distinctions during an administrative review, as experienced examiners may have a tendency to mentally "fill in the blanks," so we reiterate the importance of performing administrative reviews consistently and conscientiously.

6. Examination and Reporting Practices

Firearms Section examiners did not perform muzzle-to-target distance determinations in any of the cases that we reviewed. We understand that the Firearms Section receives few requests from investigators for distance determinations, despite the fact that such examinations can be useful in many types of cases, particularly those involving claims of self-defense and some suspected suicides.[230]

In our case reviews, we noted a tendency in the work of the Firearms Section examiners to avoid reporting results as inconclusive, even when this would have been the most appropriate conclusion. Though none of these historical cases involved identifications or eliminations, we were troubled by the examiners' apparent reluctance to report less than definitive results.

C. Conclusion

We found that the vast majority of the Firearms Section's historical analytical work was consistently good and sometimes excellent and that the cases were properly performed, adequately documented, and, with only a few exceptions, reported in a timely manner. Our review of the Firearms Section's historical work identified only one case with a major issue -- the Firearms Section has acknowledged the error in this case and took remedial action through the Crime Lab's current QA/QC program. The various minor issues we encountered in the historical firearms cases were mostly administrative in nature, involving slight documentation deficiencies and deviations from Crime Lab policies or what are now generally accepted forensic science principles. These minor issues can be attributed to a combination of analyst errors and shortcomings in the Section's past review process and quality assurance program.

V. The Trace Evidence Section

Trace evidence can consist of many different types of evidence found at a crime scene, on the victim of a crime, on a suspect, or in places visited by a victim or suspect. It can play an important role in generating investigative leads, identifying potential suspects, determining how crimes were committed, and corroborating other evidence

---

230 We previously expressed concern that the Firearms Section's practice of performing trigger pull determinations on every firearm submitted to the Crime Lab might not be an efficient use of time. We have since discussed this concern with firearms examiners and now agree that, because the time spent is minimal and means avoiding the need to re-examine the evidence if a trigger pull examination is later requested, the benefits of performing trigger pull examinations on every firearm submitted to the Crime Lab outweigh the slight risk that the time involved could be better spent on other examinations.

developed during an investigation. For example, trace evidence might be used to identify the year, make, and model of a car involved in a hit-and-run accident, based on paint particles recovered from the victim's clothing.

Fibers, hairs, paint, glass, fire debris, and many other materials are among the types of trace evidence examined in forensic labs. Forensic scientists examine trace evidence for three primary reasons:

- to identify the material(s);
- to compare the evidence being analyzed with known samples in order to determine whether they could share a common origin; and
- to provide investigative leads when suspects are unknown.

If comparisons of suspect evidence and a known sample suggest a possible common origin, the forensic scientist can help determine the likelihood that the evidence came from the same source. The cumulative effect of physical evidence, including trace evidence, can be quite powerful. When numerous pieces of evidence link a suspect to a crime scene, the probability of the suspect's involvement with the crime increases significantly. Conversely, the lack of a "match" in trace evidence can serve the critical function of excluding or exonerating an individual suspect.

A. Review of Historical Trace Evidence Cases

During the 1998-2003 period, Mr. Bolding was the Criminalist IV Supervisor responsible for the Serology/DNA and Trace Evidence Sections. Until October 2003, the Trace Evidence Section generally operated with a staff of two analysts and a Criminalist III supervisor, Reidun Hilleman. However, the Crime Lab stopped performing in-house trace evidence examinations after Ms. Hilleman was appointed the QA/QC Manager for the entire Lab in the fall of 2003.

Since then, most of the trace evidence collected by HPD that requires examination has been sent to the Texas DPS laboratory. The Crime Lab's Trace Evidence Section recently resumed some hair and paint trace evidence examinations after it received a provisional accreditation in November 2006.[231]

---

231 The trace evidence examinations performed since November 2006 are not within the scope of our review, which covered examinations performed between 1998 and 2003.

We identified 223 cases[232] that were logged by the Trace Evidence Section during 1998-2003, the period covered by our review.[233] Statisticians from PwC originally selected a sample size of 141 trace evidence files for review, but we found that many of the cases selected involved no substantive trace evidence examination. This was true for several reasons:

- Some cases involved material that was merely documented and transferred, rather than examined, by a trace evidence examiner. Criminalists in the Trace Evidence Section often received crime scene materials (e.g., latent fingerprints) that were then transferred to other sections of the Crime Lab or elsewhere in HPD for examination.

- Some trace evidence (for example, hair) was forwarded to outside laboratories, including Identigene, ReliaGene, Orchid Cellmark, and the Texas DPS laboratory.

- Finally, some case files involved trace evidence (particularly hair) that was merely inventoried and stored and never underwent in-depth forensic examination by the Crime Lab or any other laboratory. This category of cases is discussed in additional detail below.

Because the total number of trace evidence cases was relatively small, and because many did not involve substantive work, we reviewed all of the 223 Trace Evidence Section cases. We found that only 129 involved the type of substantive examination that was within the scope of our review.

Forty serology/DNA cases were also selected to determine (a) whether any trace evidence was examined in connection with those cases and (b) if so, whether there were

---

232 This number excludes cases involving fire debris evidence for several reasons. The Trace Evidence Section has not been evaluating such evidence since the fall of 2003 and has no plans to resume this area of trace evidence analysis. The state Fire Marshal currently investigates suspected arson cases for the City of Houston. Furthermore, analysis of arson evidence was not identified as an area of significant concern in connection with the events leading up to this investigation. It, therefore, was not included in the RFP issued by HPD to commission this review.

233 The period established in the RFP for trace evidence review covered 1998 to 2004, but did not reflect the fact that the Trace Evidence Section stopped performing analyses in 2003.

any issues associated with that work.[234] We selected these 40 cases because they involved either death penalty or other high profile convictions.[235]

Finally, we reviewed a total of 18 trace evidence proficiency tests, which were used to evaluate the examiners' performance between 1987 and 2002. We found the performance on the proficiency tests to be generally satisfactory.[236]

B. Issues Identified in the Crime Lab's Historical Trace Evidence Cases

We found that the quality of examinations actually performed in the Trace Evidence Section between 1998 and 2003 was generally good. However, in many cases we reviewed, nothing of evidentiary significance was developed because of a lack of adequate comparison samples or adequate information from investigators about the circumstances surrounding a case to provide context for the examinations. There is no indication that the Crime Lab vigorously pursued with investigators the need for comparison samples. As a result, HPD did not take full advantage of the potential value of trace evidence.

We identified a number of areas of concern relating to the performance of the Trace Evidence Section between 1998 and 2003. In particular, we found that 5 cases (4% of the substantive sample) had major issues, and 44 cases (34% of the substantive sample) had minor issues. Most of these historical cases were examined by Ms. Hilleman, who was the Criminalist III supervisor for the Trace Evidence Section when the examinations were performed.

1. Lengthy Delays and Lack of Follow-up

As the examples below indicate, excessively lengthy and unexplained delays sometimes occurred at several points in the Crime Lab's trace evidence examination

---

234 It is not uncommon for serology and DNA cases to contain trace evidence components. Cases such as homicides and sexual assaults in which there may be biological evidence (for example, blood or semen) may also involve evidence, such as hairs, fibers, soil, glass, etc., that could be subjected to trace evidence examination and comparison.

235 The Trace Evidence Section analyzed hair evidence relating to the 1987 case of George Rodriguez. On October 8, 2004, Mr. Rodriguez was released from prison after serological evidence used at trial was found unreliable and questions were raised regarding the reliability of the trace evidence analysis in the case. The Rodriguez case is the subject of a detailed case study later in this report.

236 We found that an examiner's performance on one 1989 proficiency test was unsatisfactory, but Crime Lab records indicated that this test was taken by an unidentified trainee.

process. In some historical cases, weeks, months, or even years elapsed before any examination was performed or a report was issued.

For example, in a hit-and-run case that occurred on December 28, 2002, hairs from the suspect vehicle were submitted to the Crime Lab on January 9, 2003 and examined that same day. Some of the hairs were described in the examiner's notes as human head hairs, and several were described as suitable for DNA analysis. These hairs were retained in a freezer in the Crime Lab. However, no report was issued until more than two years later, on April 15, 2005. The report states: "If further analysis is required in this case, please make an additional request." A request for more information was made on April 18, 2005, when the investigator asked if the hairs were human or animal. This information was already available in the examiner's notes, but there is no record in the file indicating that this finding was ever communicated to the investigator.

In another historical hit-and-run case, skin tissue from the bumper of a suspect vehicle was submitted to the Crime Lab on November 15, 2002. On December 4, 2002, the Crime Lab was asked to compare the victim's blood and hair to evidence collected from the suspect vehicle. The trace evidence examiner did not begin examining the evidence until January 4, 2004, and "possible skin tissue" was then transferred to an outside DNA laboratory (Identigene) for analysis. The prolonged delay in processing this evidence was not consistent with generally accepted forensic laboratory principles. We note, though, that this case occurred during a tumultuous time in the Crime Lab when the DNA Section was being shut down and alternative arrangements for the analysis of biological evidence were just being developed.

Delay and inadequate documentation issues are also evident in trace evidence files relating to a 2001 homicide case. The offense occurred on September 28, 2001, and evidence was submitted to the Crime Lab on November 26 and December 17, 2002. Although the evidence was initially examined on December 12, 2002 and on January 16, 2003, the only report in the case file is dated July 19, 2004. The report states that "[a] supplement will follow that will document the examinations performed on the above items." However, there is no such supplement in the file and no explanation for its absence. Generally accepted forensic science principles require that a report always be prepared to summarize the examinations performed and results obtained, even if, for well-documented reasons, the report need not be issued.

Significant delays in the examination of evidence, such as in the cases described above, lead to "cold" information that is, for obvious reasons, not as valuable to investigators as more timely reports would be. The lack of follow-up we observed in some Trace Evidence Section cases may be attributable in part to a lack of communication with investigators or the District Attorney's Office. The consequences

of poor communication between investigators, prosecutors, and crime laboratory staff include an increased likelihood that an examiner may fail to recognize the significance of a particular piece of evidence or otherwise be unable to express the significance of a finding.

2. Minimal Attempts to Generate Investigative Leads

The potential value of trace evidence examinations was not being fully utilized during the 1998-2003 period. In some cases, either minimal or no attempts were made to examine evidence that could have generated important investigative leads. For example, fibrous insulation material collected from a crime scene and from two suspects was submitted to the Crime Lab on October 28, 1998. The items were not examined until more than eight months later, on June 30, 1999. The examination notes describe each of the three items as consisting of "various fibers (cotton, wool and some synthetic, various colors) dust particles."

Because this evidence involved a number of different fiber types and colors, it could have provided very strong associative evidence if a more detailed examination had been conducted and reported. Although the file notes that were recorded are informative, the actual Crime Lab report states only that the three items "consist of assorted compressed fibers and other dust particles." As a result, the report in this case does not communicate to the investigators the true potential value of this evidence. Moreover, the report is dated August 2, 1999, which was more than nine months after the evidence was submitted to the Crime Lab and likely too late to be of much use to the investigators.

3. Adherence to Generally Accepted Forensic Science Laboratory Principles

Generally accepted forensic science principles require that controls be used and recorded in laboratory notes to ensure the reliability of results in trace evidence testing. For example, "reagent blanks" are used to ensure that test results are not influenced by variations or inconsistencies in the reagents themselves. The use of these and other controls is especially important in connection with chemical tests for the presence of saliva, blood, and semen. However, there is often no reflection in a number of case files that appropriate controls were used or recorded by the Trace Evidence Section.

4. Documentation

Documentation is sparse in many of the historical trace evidence files. The files rarely contain the notes or telephone logs that are commonly used in forensic laboratories to document communications with investigators and prosecutors.

Similarly, there is often no documentation in the files explaining the reasons certain evidence was not examined. Some of the historical case files could have been greatly enhanced by the use of sketches or photomicrography, which would aid the analyst or reviewer in reconstructing the case (e.g., when called upon to testify at trial or in connection with legal appeals).

Additionally, a few case files lacked documentation of any technical or administrative review in cases in which the notes indicate that no trace evidence examinations were performed. The Crime Lab's SOPs require such reviews in all cases, whether or not an examination was actually performed.[237]

C. Review of Historical Trace Evidence Examinations in Selected Serology and DNA Cases

We did not identify any major issues relating to trace evidence examinations in the 40 serology/DNA historical cases selected for review. Minor issues were identified in 5 (12.5%) of these cases, and they primarily involved documentation issues similar to those described above.

Two death penalty case files had trace evidence issues that we determined were minor. In the first case, the work notes contained insufficient documentation of the hair comparison that was performed. In the second historical case, hair samples were collected, but the case file contained no Trace Evidence Section report.

Minor issues were identified in a third, non-death penalty case because of significant differences in the level of detail in the work notes relating to the known and questioned samples. This case involved hair comparisons, and the work notes contained appropriately detailed observations of the microscopic characteristics of the known hairs. However, there was no detailed description of the questioned hairs other than that they were "microscopically consistent" with the known hairs. We reviewed the transcript of the examiner's trial testimony in this case, and it appropriately reflected the limits of the observations that were made and their interpretation.[238]

Similar issues were identified in a fourth case, in which numerous hair associations were made linking questioned hairs to the victim. The victim's hair characteristics were well described, but the questioned hairs were not described in sufficient detail to document the association.

---

237 This is an SOP that applies to all sections of the Crime Lab.

238 This was the highly publicized case involving George Rodriguez, which is the subject of one of our case studies discussed later in this report.

In the fifth minor issue case, we found that the file contained no information regarding the source of some items of evidence. Additionally, some descriptions in the notes and report are too vague to be informative. As a result, it is not possible to interpret the significance of the findings that are documented in this file. Finally, the work notes indicate that several items were examined, but those items are not referred to in the report.

D. Conclusion

During the period of our historical review, most of the work performed by the Trace Evidence Section was good. Much of the potential value of trace evidence was not realized during this period, however, because HPD investigators and the Crime Lab did not pursue potentially significant findings and evidence. The follow-up that did occur often took place only after lengthy delays that reduced the likelihood of a successful outcome for the investigation. Sparsely documented files also diminished the usefulness of the reviews that were performed.

VI. The Toxicology Section

Forensic toxicology involves the use of screening tests and confirmatory tests to detect, quantitate, and identify potential toxins, including drugs and alcohol, in body fluids and tissues. During the screening step of this process, samples are tested for the presence of a wide range of drugs or other toxins. Screening tests are not necessarily specific for a particular toxin, so, until initial results are confirmed, they are viewed as tentative, at best. Confirmatory tests are important because they reduce the risk of false positive test results, which can occasionally occur when a substance's chemical structure is similar to that of another substance or when a contaminant has been introduced.

A. Testing Procedures Used by the Toxicology Section

At the Crime Lab, screening tests were commonly performed using fluorescence polarization immunoassay ("FPIA") techniques and thin layer chromatography ("TLC"). The Toxicology Section used an FDA-approved FPIA technique as a screening test. FPIA involves the use of a drug antigen that is created with a fluorescent "label." When these antibodies are added to a blood or urine specimen containing the drug antigens, the antigens in the sample move to attach themselves to the antibodies. When the sample is exposed to light, this movement creates measurable changes in the light's intensity. The changes are proportional to the quantity of drug antigen present in the sample.

Like many other forensic and clinical laboratories, the Crime Lab used a commercially available TLC system to test urine samples for drugs. TLC is used to separate components of a mixture and to tentatively identify those components. The varying colors, shapes, and *Rf* values[239] observed on the resulting chromatogram are compared with patterns produced by known compounds to make a tentative identification of substances present in the sample.

Gas chromatography/mass spectrometry ("GC/MS") was normally used by the Toxicology Section as a confirmatory test. The scientific principles and techniques involved with GC/MS testing are described in the discussion of the Controlled Substances Section, above.

Gas chromatography with flame ionization detection was used by the Toxicology Section for blood and urine alcohol testing. Components exiting from the GC column pass through a flame and are burned. The ions produced in this process generate a measurable electric current that correlates to the quantity of alcohol burned.

B. Review of Historical Toxicology Cases

Toxicology case files were selected with the assistance of PwC from a total universe of 1,555 toxicology cases handled by the Crime Lab between 1998 and 2004. We recalibrated our original toxicology sample of 101 cases after discovering that a significant number of cases in the sample actually involved analysis by other sections in the Crime Lab, particularly the Controlled Substances Section.[240] Search criteria were adjusted, and the recalibrated toxicology sample included 308 cases. The total sample of 409 historical cases (101 from the original sample and 308 from the recalibrated sample) was reduced to 396 after duplicates (cases that appeared in both the first and second samples) were eliminated. Despite these adjustments to our search criteria and

---

239 *Rf* value is expressed in terms of a ratio, in which the distance traveled by the substance being tested is compared with the distance traveled by the transporting solvent.

240 As discussed in detail in our global recommendations for the Crime Lab, the Crime Lab tracks cases based on the uniform crime reporting ("UCR") code assigned to the underlying investigation by the HPD investigator. Thus, the Crime Lab's case management system tracks Lab files based on the underlying offense rather than the type of analysis performed by the Lab. As a result, we found that a number of cases that were initially identified, based on their UCR code, as potential toxicology cases actually were analyzed in the Controlled Substances Section.

sample size, only 213 of the cases in the final sample actually involved toxicology casework.[241]

With only a few exceptions, the work performed by the Toxicology Section between 1998 and 2004 was satisfactory. During that time, there was an obvious and demonstrable improvement in the analytical procedures and processes used by the Section. Toxicology case files in the historical sample were well organized; the reviews were, for the most part, properly documented; and an appropriate range of analytical procedures was performed in most of the cases reviewed.

There were no significant issues identified in the historical blood and urine alcohol cases reviewed. Moreover, there was continual improvement in procedures and documentation in this area during the period covered by our review. As of 2004, the procedures used by the Crime Lab were state-of-the-art.

1. Major Issues in the Crime Lab's Historical Toxicology Cases

We identified only one historical toxicology case that involved a major issue relating to the reliability of the work performed. In that case, the analyst concluded -- on the basis of GC/MS analysis alone -- that a blood sample was positive for heroin, cocaine, and PCP. However, no morphine was identified by the analyst. We believe that the GC/MS data were interpreted correctly, but, because heroin is almost immediately metabolized into morphine when it enters the human body, a positive heroin test without the presence of morphine is an unlikely pharmacological result and may indicate possible sample contamination. In light of the pharmacologically questionable result and the absence of a second test, we consider the work in this case to be inconsistent with generally accepted forensic science principles; additional work should have been done.

2. Minor Issues in the Crime Lab's Historical Toxicology Cases

Of the 213 historical toxicology files that we reviewed, 86 (40%) had minor issues. We divide those minor issues into the following categories.

---

241 We consulted PwC to determine whether the toxicology case file sample was sufficient under statistical standards to establish confidence in the results of our review. PwC confirmed that the results maintained a high level of statistical precision because of the very conservative parameters that were used to establish the sample.

a. Test Administration and Interpretation Issues

A number of historical case files involved drug identifications that were based on a single test, usually GC/MS. Analysts may have treated the GC retention time in a GC/MS run as a second, confirmatory test, but this is not an independent test.

The analytical data were not interpreted as rigorously as they might have been in some of the minor issue cases. For example, we did not consider some of the MS "matches" identified by analysts to be strong matches.

We also observed deficiencies in the identification of some drugs and metabolites in some toxicology cases. However, in each of these cases, other drugs and metabolites were properly identified and correctly reported. As a result, because other controlled substances were detected in the samples, we concluded that the failure to identify the additional drugs or metabolites in the samples probably did not have any effect on the outcome of the cases.

b. Documentation

Many historical case files did not contain adequate documentation of all the work that may have been performed. In some cases, the analyst's summary sheet in the file shows that TLC was run, but there is no documentation (e.g., a copy or photocopy of the chromatogram) of the results of such analyses. In a few historical cases, there were suggestions of cocaine contamination, but cocaine was not reported.

c. Technical and Administrative Reviews

Many historical cases lacked technical review by a qualified person other than the analyst who had performed the work. This typically occurred during the period when the Section supervisor was the only person qualified to perform toxicological analysis at the Crime Lab.

In one historical case file, some of the gas chromatograms were labelled with the wrong date and case file number. This was an administrative issue, but the fact that it apparently was not picked up during the original technical review raised some concern about the thoroughness of that review.

C. Review of Historical Proficiency Tests Performed by Toxicology Section Analysts

Drug proficiency tests were usually administered to analysts in the Toxicology Section five to six times per year. However, Ms. Louie acknowledged that no tests were administered for several years during her tenure as the Section supervisor. Our

investigation revealed that proficiency testing stopped between late 1995 and early 1998, and the Crime Lab's subscription to a bi-annual Department of Transportation blood alcohol proficiency testing program also lapsed at some point during this time. We ultimately identified and reviewed 33 proficiency tests administered to Toxicology Section analysts between 1998 and 2003.

Most of the proficiency test results were good, and some were excellent. Tests were typically examined by more than one analyst and reviewed by the Section supervisor. However, three tests performed during the review period yielded false positive results -- the Crime Lab analysts incorrectly reported drugs that were not actually present in the test sample.

1. False Positives

- In one test, three analysts noted "indications" of methamphetamine in their work notes, but none of the analysts attempted to confirm the identification. Although methamphetamine was not present in the sample, it did contain a drug with a chemical structure similar to methamphetamine.

- In another test, two analysts incorrectly reported the presence of methorphan (a codeine-based cough suppressant), but failed to identify cimetidine that was present in the sample.[242]

- A third false positive involved the identification of a narcotic metabolite by the Section supervisor. To her credit, when she learned of the correct answer to the test, she rated her own performance on this proficiency test as unsatisfactory.[243]

2. Substances Present But Not Detected

In a number of other proficiency tests, Toxicology Section analysts failed to identify substances that actually were present in the sample. One was a cannabinoid commonly encountered in forensic toxicology. For no apparent reason, the analysts

---

242 Cimetidine is commonly prescribed for the treatment of gastric reflux disease. It is not a drug of abuse and, therefore, is not the type of drug typically tested for in DUI cases.

243 Additionally, a fourth false positive test result occurred in a proficiency test administered in 1997 (outside the 1998-2004 period of our formal review). Toxicology Section analysts identified the presence of cocaine in the sample. The sample did contain a cocaine metabolite, but the test provider firmly denied that the sample contained any cocaine, and most labs participating in the test did not report it. The Crime Lab's analytical data clearly shows cocaine, and the most reasonable explanation for this is sample contamination at some stage in the examination process.

simply did not perform tests that would have identified the cannabinoid. In another proficiency test, the analysts correctly identified cannabinoids, but did so based only on a positive FPIA and inadequate GC/MS test results.[244]

D. Conclusion

Most of the work performed by the Toxicology Section during the period of our historical review was good. We identified several cases that involved potential sample contamination, and false positives occurred in a few of the historical proficiency tests that we reviewed. Documentation deficiencies, a lack of rigor in the interpretation of analytical data, and the absence of thorough administrative and technical reviews led us to identify minor issues in a significant number of the historical cases. However, we found that by 2004 the Toxicology Section was using state-of-the-art procedures and that documentation was much improved.

VII. Questioned Documents

Forensic document examination can play a significant role in developing investigative leads and resolving criminal cases. In addition to many types of documents in fraud cases, notes presented during bank robberies, written bomb threats, drug tally sheets, suicide notes, threatening letters, and gambling tip sheets can all provide critical information to investigators. Even documents that appear to be blank may contain indented impressions of handwriting, which can be compared to known samples and used to include or exclude potential suspects. Document examination can be used to establish potentially crucial facts, including the date, source, history, preparation, authenticity, and relationship of documents.

Signature and handwriting examinations involve the comparison of writing samples from a suspected writer with a sample of unknown origin. The examiner evaluates specific characteristics such as the formation and proportions of letters, fluency of pen strokes, pen lifts, and pen pressure variations to identify similarities or differences in the two writings. In some cases, this analysis can result in the positive identification or definitive exclusion of a suspected writer.

Handwriting analysis is one of the more commonly performed types of document examination, but forensic document examination can also involve many other tasks, including the identification or comparison of papers, watermarks, inks,

---

244 In that same test, the analysts failed to identify the presence of erythromycin, an antibiotic that, like cimetidine, is not typically tested for in DUI cases.

typewriters, printers, checkwriters, photocopies, and facsimiles. It can also involve the restoration of altered, damaged, obliterated, or erased text.

A. History of Questioned Documents Examination and HPD

Until 2004, the Questioned Documents Section was a component of the Identification Division. In its early years it employed several document examiners, but it was closed in the mid-1980s during a period of examiner attrition and waning requests for document examinations. For approximately fifteen years (from the mid-1980s until 1999), document examination requests generated by HPD investigators were referred to the Texas DPS laboratory.

In 1995, HPD began recruiting questioned documents examiners. Randy Carodine, who is currently HPD's sole document examiner, was hired as a classified officer assigned to the Identification Division. After completing police academy training, Mr. Carodine began a three-year training program provided by members of the Southwestern Association of Forensic Document Examiners ("SWAFDE"). Because the Questioned Documents Section had not been in operation for approximately ten years by that time, Mr. Carodine had to look to outside sources for training, technical review services, advice on equipment purchases, and mentoring.

The Questioned Documents Section ultimately re-opened in 1999, after SWAFDE trainers determined that Mr. Carodine was proficient in document examination. To promote the re-opening of the Questioned Documents Section, Mr. Carodine circulated an internal HPD notice. He also visited each HPD division to distribute pamphlets that described available services, as well as the process for submitting documents for examination. Because of limited resources and a lack of equipment, Mr. Carodine was able to perform only handwriting examinations when the Section first opened. HPD later acquired an infrared viewing instrument and other equipment which permitted enhancement of the range of document examinations performed.

A change in Texas state law prompted the transfer of the Questioned Documents Section from the Identification Division to the Crime Lab in 2004. The legislation, which went into effect in 2005, permits the admission of forensic science evidence in court proceedings only if the evidence comes from an accredited laboratory. This change produced some positive results for the Section, including the development of formalized SOPs, and the allocation of additional funds for the Crime Lab.

B. Review of Historical Questioned Documents Cases

When the Phase II Plan was developed, it was anticipated that our forensic experts would review all of the questioned documents cases worked between 1999

(when the Section re-opened) and 2004. Approximately 200 cases were logged in by the Questioned Documents Section during that period, but we found that fewer than half resulted in the generation of written reports.

Mr. Carodine's practice was to record telephone and other inquiries in the Questioned Documents Section case log and to establish a case number for those inquiries, even when no report relating to the matter was ever prepared. As a result, only 91 cases were actually available for review, all of which have been reviewed and were discussed in our Fourth Report, which was released on January 4, 2006.

Our experts were impressed with Mr. Carodine's knowledge, the quality of his work, the level of effort he commits to maintaining the integrity of the Section, and the excellent documentation supporting his reported conclusions. Mr. Carodine's work has been outstanding in most of the cases he has completed. He has also successfully completed external proficiency tests that are administered on a bi-annual basis.

No major issues were identified in connection with the 91 questioned documents files reviewed. Most of the minor issues identified and described below occurred before the Crime Lab implemented more detailed, specific SOPs in 2004.

1. Quality of the Questioned Documents SOPs

Before the Questioned Documents Section transferred to the Crime Lab, it relied on a four-page SOP. Since then, much more detailed SOPs have been established to meet the requirements for ASCLD/LAB accreditation. We reviewed these detailed SOPs and found them to be well written. The SOPs are current and reflect generally accepted forensic science principles. However, they include procedures for examinations that are not currently performed in the Crime Lab, such as typewriter examinations and pH pen examinations. We believe that it would be better to exclude these procedures from the SOPs until such examinations are actually being performed at the Crime Lab.

2. Written Reports

As is noted above, the case log maintained by the Questioned Documents Section indicated that more than 200 cases had been worked between 1998 and 2004. We learned, however, that Mr. Carodine's practice was to record case numbers in the log to document that he gave advice or other information to an investigator, even though a written report documenting that advice was not generated. We believe that, in every case that is opened, a written report -- brief though it may be -- should be prepared to document how the case was resolved.

3. Technical Review

Technical review is a process intended to ensure that conclusions expressed in a written report are appropriate and supported by documentation in the file. We noted that some of the work performed by the Questioned Documents Section had not received a technical review. This is partly because supervisors did not require such reviews when the Section was a component of the Identification Division.

Nevertheless, Mr. Carodine recognized the importance of such reviews and established an informal network of outside examiners who were willing to assist with this process. Mr. Carodine informed us that he typically sought independent technical review only when he reached definitive conclusions. Cases that generated equivocal or inconclusive results were usually not submitted for outside review, but, in some instances, they were. In some cases, technical review was obtained but not documented because the reviewer did not want to risk the possibility of being subpoenaed in connection with the case. These historical practices with respect to the technical review were a weakness in Mr. Carodine's otherwise high quality casework.

C. Conclusion

We were consistently impressed with the quality of the work performed by HPD's questioned documents examiner. Only minor issues were identified in our review of historical cases, and the minor issues that we did note were all administrative issues, rather than issues involving the technical proficiency of the questioned documents examiner. Moreover, most of the minor issues that we identified were addressed by improved SOPs that the Crime Lab implemented in 2004.

VIII. Conclusions Regarding the Crime Lab's Historical Operations

Our review of over 3,500 cases analyzed by the Crime Lab prior to its accreditation by ASCLD/LAB has produced a detailed and complex portrait of the quality of forensic science work performed in the Lab during a period that extended, in some of our reviews, for a period of close to 25 years. We observed high quality work performed in the Crime Lab's Toxicology, Firearms, and Questioned Documents Sections and found very few major issues in the cases we reviewed in these disciplines. Although the Crime Lab generally performed reliable examinations of trace evidence, we found that poor communication between the Lab and HPD investigators may have diminished the value of this work to HPD's investigations. Although the Controlled Substances Section's analysis of marijuana and cocaine samples -- which comprised the vast majority of its workload -- was sound, we found a number of serious problems with the Section's analysis of other types of evidence, including liquids and tablets.

The body of the Crime Lab's historical serology and DNA analysis work, however, is extremely troubling. We found significant and pervasive problems with the analysis and reporting of results in a large proportion of these cases. The Crime Lab's substandard, unreliable serology and DNA work is all the more alarming in light of the fact that it is typically performed in the most serious cases, such as homicides and sexual assaults.

Several of the root causes for the severe problems that afflicted the historical Crime Lab were apparent early in our investigation when we began reviewing HPD's files related to funding and support for the Lab; interviewing Lab managers and employees and other HPD personnel; and reviewing the Lab's SOPs, administrative files, and casework. These central themes, which were borne out by our review of the Crime Lab's historical cases, lie at the heart of the crisis that consumed the Lab over four years ago. Each of these issues had an impact on the Crime Lab's casework and the quality of forensic science services that the Lab was able to provide to the Harris County criminal justice system.

A. Lack of Support and Resources for the Crime Lab

It is clear that, over the 15 years preceding the DNA/Serology Section's closure in December 2002, HPD and the City failed to provide the Crime Lab with adequate resources to meet growing demands for its services. During these years, Houston grew to become the fourth largest metropolitan area in the United States, and the level of criminal activity increased as the City grew. Yet, as its caseload swelled, the Crime Lab struggled to keep pace. As a support function populated by civilian employees, the Crime Lab was marginalized within HPD. Salaries for Crime Lab personnel were significantly lower than the salaries offered in other laboratories, including other public laboratories in the Houston area. As a result, the Crime Lab experienced difficulty attracting and retaining well-qualified forensic scientists. Although the number of forensic scientists authorized for the Crime Lab grew modestly between 1994 and 2002, turnover or inadequate funding meant there were always positions that remained vacant, sometimes for extended periods of time. The calcified organization of the Crime Lab afforded analysts very little opportunity for promotions or pay increases.

With some notable exceptions, the technical errors we identified in the Crime Lab's historical cases were not attributable to misconduct on the part of an individual analyst. Rather, the major issues that we identified in the Crime Lab's historical casework are attributable in large part to poor training and lack of competent technical guidance. We found documents reflecting DNA analysts' frustrations and concerns over the lack of training as early as 1994, soon after the Crime Lab began performing DNA analysis. Training was one of the first areas of the Crime Lab's budget that was cut as funding for the Lab became tight. This lack of training was reflected in the Crime

Lab's DNA casework where HPD analysts demonstrated fundamental failures to understand and apply generally accepted forensic science principles.

Finally, under HPD's and the Crime Lab's former management, accreditation never was a realistic possibility. Because of the roof leaks that allowed water to leak into the Crime Lab for more than six years[245] and because of the lack of sufficient funding, by the early 2000s the former head of the Crime Lab, Donald Krueger, knew that the Crime Lab would not be able to obtain ASCLD/LAB accreditation without significant improvements. Mr. Krueger was uncomfortable with the prospect of inviting outside inspectors to review the Crime Lab. Without additional funding and support from HPD and the City, the Crime Lab had no realistic prospect of becoming accredited and integrated into the national forensic science community.

B. Ineffective Management Within the Crime Lab

Although HPD and the City must be faulted for failing to provide the Crime Lab with the resources it needed, there also was a lack of strong and effective leadership within the Lab. Mr. Krueger, who was head of the Crime Lab from 1995 to early 2003, was an isolated and detached manager of the Lab. Mr. Krueger rarely met with Crime Lab analysts as a group, and he relied heavily on James R. Bolding, the head of the DNA/Serology Section, and the other managers, to run their Sections while providing little oversight. Mr. Krueger told us that he was surprised and shocked when, in December 2002, outside auditors advised him that the DNA Section was in shambles. Given the state of affairs described by the auditors and reflected in the Section's casework, this could only have been the reaction of a manager extremely far removed from the work performed and reported out by the DNA Section.

For his part, Mr. Bolding probably lacked the competence to recognize the problems with the Crime Lab's DNA work -- he was never trained in PCR techniques and clearly had no better understanding of the proper interpretation and presentation of DNA typing results than his subordinates. Mr. Krueger failed to make a forceful case with HPD command staff for addressing critical needs, such as the severity of the roof problem and the desperate need for a direct supervisor over the DNA/Serology Section. Although requests for funding were made regularly over the years,

---

245 The City and HPD were aware of problems with the roof at the 1200 Travis Street HPD headquarters building before the Crime Lab moved into the facility in 1997. In 2001, Tropical Storm Allison flooded the Crime Lab, and boxes containing biological evidence became soaked and the evidence likely contaminated. Yet, the roof leaks continued unabated in a scientific laboratory responsible for processing sensitive biological evidence for use in criminal matters. The roof problem was not addressed until 2003, after the crisis enveloped the Crime Lab.

Mr. Krueger failed -- almost surely because he did not fully appreciate the problem himself -- to explain the disastrous potential of the lack of supervision in the DNA/Serology Section.

We also found that there was inadequate management of the strong and difficult personalities within the Crime Lab. Morale was consistently low among Crime Lab analysts, and discontent was widespread. After Dr. Baldev Sharma was made the line supervisor over the DNA/Serology Section in 1993, open and prolonged feuding developed between Dr. Sharma and his supervisor, Mr. Bolding. Grievances and IAD complaints between and among analysts and supervisors, some of which were quite petty, were commonplace. Finally, as demonstrated by the drylabbing incidents involving two Controlled Substances Section analysts, described in our previous reports and again in this report,[246] Crime Lab managers found it difficult to discipline or remove incompetent personnel. These personnel problems fostered a highly dysfunctional, and, in some respects, unprofessional, laboratory environment.

C. Lack of Adequate Quality Control and Quality Assurance

Managers and supervisors within the Crime Lab failed to ensure that the analytical and quality control procedures employed by the Lab were current, properly designed, and complete. SOPs for most of the sections in the Crime Lab, including the DNA/Serology Section, consisted of procedures and reference materials cobbled together over time without periodic re-evaluation and reorganization. There were few technical reviews of analysts' work, including review of their test results, interpretation of data, and reporting.

Even though Dr. Sharma was appointed the QA/QC Manager for the Crime Lab in 1996, he was unproductive in this position and the Lab failed to develop a true quality assurance program. The Crime Lab stopped performing Lab-wide inspections of casework until approximately 1997, but those inspections were largely administrative and did not involve review of analysts' results and interpretation.

D. Isolation of the DNA/Serology Section

Major problems beset the DNA/Serology Section of the Crime Lab almost from its inception in the early 1990s. These problems were insufficiently recognized by Lab management and the HPD command staff for many years. By the time of the 2002 DPS

---

246 These drylabbing cases were first discussed in our Second Report, which was issued on May 31, 2005. These incidents are described in detail in our discussion regarding the Crime Lab's historical controlled substances cases.

audit, the DNA Section was in shambles -- plagued by a leaky roof, operating for years without a line supervisor, overseen by a technical leader who had no personal experience performing DNA analysis and who lacked the qualifications required under applicable FBI standards, staffed by underpaid and undertrained analysts, and generating mistake-ridden and poorly documented casework. A critical component of the FBI standards, to which the Crime Lab agreed to abide when it registered to participate in the CODIS database in 1998, is a requirement for bi-annual reviews by outside agencies. Such a review never occurred until the fateful DPS audit in December 2002. The internal reviews of the Section, performed by Mr. Bolding in 2000 and 2001, made findings regarding the condition of the DNA Section that were largely contradicted by the 2002 DPS audit, which used the same standards supposedly used by Mr. Bolding. Despite the Crime Lab management's recognition as early as 1996 that accreditation was becoming a necessity, the Lab's efforts toward achieving accreditation never gathered any momentum of any kind; no outside inspection of the DNA Section related to accreditation was ever performed.

The purpose of outside scrutiny is to shed light on a laboratory's practices, to focus attention on existing deficiencies and potential problems, and to broaden the perspective of laboratory analysts by bringing them in contact with personnel who work in other forensic laboratories. By insulating itself from outside scrutiny, the Crime Lab never received these benefits. Flawed practices and embedded misunderstandings -- for example about the proper calculation and use of frequency estimates in DNA cases -- became accepted by analysts within the DNA/Serology Section as the correct way to do things. These misunderstandings infected the work of the Section's analysts from the analysis through trial testimony. Indeed, we observed the same types of major issues across all the Crime Lab's DNA work, regardless of the analyst or the DNA typing system (RFLP, PCR, or STR) used.

Detailed Case Studies

In addition to reviewing hundreds of cases included in our samples of the Crime Lab's cases, our plan for the review of the Lab's historical operations included detailed studies of the role forensic science played in the cases related to four defendants -- Lawrence Napper, George Rodriguez, Josiah Sutton, and Nanon Williams. Each of these cases has a relatively high profile, each has been subject to media coverage, and each involves work by the Crime Lab that has been called into question. We selected these cases in order to provide a detailed account of the Crime Lab's role in the investigation and prosecution of these defendants and to provide our assessment of the impact that forensic science, performed by the Crime Lab and by other laboratories, has had on the defendants and the victims in these cases.

These cases also provide illustrative examples of the Crime Lab's work across a number of forensic science disciplines. The Rodriguez case involved serology and trace evidence, the Williams case involved firearms evidence, and the Napper and Sutton cases involved DNA evidence.

I. Lawrence Napper

On February 11, 2001, sometime just before 3:00 p.m., the victim, a 6-year-old boy, was abducted by a "skinny black male" wearing a blue hat and driving a late model black car. The boy had walked to a convenience store with his older sister. While the sister was inside the store, the male in the late model black car, which was parked in front of the store, offered the boy money if he would get into his car. When the boy refused, the man got out of the car, picked the boy up, and shoved him into the vehicle. As the boy cried, the kidnapper drove him to a small house, which the man told the boy, as the boy subsequently reported to an HPD officer, was "his friend's house."

Once inside the house, the kidnapper tied the boy boy's limbs to each corner of a small bed. While the boy was tied to the bed, the man slapped him repeatedly and told him to be quiet. The boy recalled that the man stripped down to his underwear and applied an "orange grease" to his body and face. Several weeks after the kidnapping, on March 15, 2001, the boy told police that, while he was tied to the bed, the man "stuck his thing in my mouth and then peed in my mouth." The boy also told police that, after the assault, the man made him take a bath.

The day after the abduction, on February 12, 2001, at approximately 6:00 a.m., the assailant drove the boy back to the same convenience store where the abduction

occurred and released him. The boy's mother immediately took him to Texas Children's Hospital to be examined.

A. The Investigation

HPD investigators arrived at the hospital to interview the boy and collect evidence. An officer observed that the boy had "bright red marks across both sides of his face which were clearly visible." The boy described the kidnapper to police, as well as the house to which he was taken by his assailant. An attending physician told investigators that he saw no evidence of a sexual assault, and at that time the boy did not tell police about the sexual assault. A Crime Scene Unit ("CSU") investigator collected the boy's clothing and called the Crime Lab from the hospital and spoke with Reidun Hilleman. Ms. Hilleman told the CSU investigator that he could bring the evidence directly to the Crime Lab. Ms. Hilleman suggested that the CSU investigator take swabs of the victim's face to attempt to obtain contact DNA that may have transferred from the assailant when he slapped the boy. The CSU investigator took two swabs of the outside of the boy's cheeks, which, along with the boy's clothing, two rectal swabs, and an oral swab, were hand-delivered to the Crime Lab.

On February 14, 2001, the boy's aunt told the police that the boy had revealed more details about what had happened while he was tied to a bed at the assailant's house. The aunt told police that the boy had told her that the assailant forced the boy to perform oral sex on him, threatened to stab the boy if he refused do it, and hit him. Investigators interviewed witnesses who had observed the kidnapping and developed a composite sketch of the suspect, which was released to the public.

On February 23, 2001, HPD received a "crime stoppers" tip from a woman who "had information that Lawrence James Napper fit the composite drawing of the suspect in this case, drove a car that was similar to the one described in this case and liked to tie people up to the bed and beat them during sex. " The caller also told police that Mr. Napper was a registered sex offender. Police found that Mr. Napper was indeed a registered sex offender and that he had been paroled from prison on April 21, 2000.[247] Investigators also discovered that there was an outstanding warrant for Mr. Napper's arrest, which had been issued on February 18, 2001 for a parole violation.

---

[247] After he was released on parole, Mr. Napper originally was required to wear an anklet equipped with a global positioning system ("GPS") device. On December 12, 2000, the GPS device was removed, and, from that time until his arrest on February 23, 2001, Mr. Napper was monitored with a radio frequency/electronic monitoring device that was not capable of tracking his precise whereabouts at all times. The radio monitoring device was only capable of recording when Mr. Napper left and arrived at his home.

Upon learning of the outstanding warrant, police immediately went to Mr. Napper's residence. After speaking with Mr. Napper's brother, who lived nearby, the officers learned that Mr. Napper was at home. The officers then arrested Mr. Napper inside his house. The officers' report notes that they observed in the house a "brown couch," small bed, and "bottle of orange lotion," all of which were consistent with details the boy had provided about the house where he was assaulted.

B. The Crime Lab's Work

On February 12, 2001, the same day that the CSU investigator delivered the evidence collected from the victim to the Crime Lab, Lab analysts Joseph Chu and Mary Childs-Henry screened each of the evidence items for indications of semen. Ms. Childs-Henry's lab notes reflect that p30 tests performed on both of the "face-cheek" swabs were positive, indicating the presence of semen.[248] The Crime Lab's report entered into OLO by Mr. Chu and Ms. Child's Henry, dated March 26, 2001, stated that "semen was detected on the face/cheek swabs" and that "no semen was detected on any other items" that the Crime Lab tested, including clothing and bedding seized from Mr. Napper's residence.

Ms. Childs-Henry's documentation reflecting the serological screening she performed on the "face/cheek" swabs is poor, but typical of the Crime Lab's documentation practices generally during that period. Although it is not completely clear, it appears that Ms. Childs-Henry's positive test for p30 was based on an Abacard test because there is no documentation in the Crime Lab's ledgers or notebooks indicating that any other testing for the presence of semen was performed. The Abacard test, although widely used and generally accepted as a presumptive test for semen, is not definitive for the presence of semen, and false positives are not uncommon. Also, the result, whether positive or negative, was not recorded photographically for independent verification. Ms. Childs-Henry did not perform a microscopic examination to attempt to confirm the presence of any sperm cells on either of the "face-cheek" swabs.[249]

---

248 That same day, Ms. Hilleman notified investigators that the swabs from the victim's face contained semen.

249 Ms. Childs-Henry's testimony during Mr. Napper's trial is not illuminating as to the work she did to support her reported conclusion that semen was detected on the "face/cheek" swabs. Regarding her serological work on the swabs, she stated only that "[f]rom examining those swabs that were brought into the crime laboratory and transferred to me, I did an analysis because I was looking for the presence of semen on the swabs. From doing that analysis, I determined that the face swabs contained semen." *State v. Napper*, Cause Nos. 886345 & 886346, Tr. Vol. 8, at 200:16-21 (Nov. 7, 2001).

Ms. Childs-Henry performed a differential extraction to obtain DNA from both of the "face-cheek" swabs. In an affidavit prepared by Ms. Childs-Henry in June 2005, she stated that she prepared "four vials containing DNA from the swabs collected from the complainant's face and check."[250] These four vials contained epithelial and sperm fractions from each of the swabs. On February 15, 2001, Ms. Childs-Henry transferred the vials containing DNA extracted from the "face-cheek" swabs to Mr. Chu for DNA analysis.

On February 20, 2001, Mr. Chu performed STR testing on all four samples provided to him by Ms. Childs-Henry. The STR electropherograms related to testing on the four "face-cheek" swab samples reflect a mixture of DNA profiles. On February 27, 2001, after Mr. Chu already had completed testing on the evidence samples, he performed STR testing on a reference sample obtained from Mr. Napper. Mr. Chu did not prepare an allelic table reflecting his DNA results from the evidence and the reference standards obtained from Mr. Napper and the victim, which was consistent with the general practice in the DNA Section at the time. Based on our review of the electropherograms in this case, we prepared the following allelic table reflecting the DNA results that Mr. Chu obtained.

STR Results Obtained by Mr. Chu

Sample	D3S1358	VWA	FGA	AMEL	D8S1179	D21S11	D18S51	D5S818	D13S317	D7S820
Napper	16	17	18.2, 21	XY	14, 15	29, 32.2	16, 20	10, 13	11, 12	8, 10
Swab #1 epithelial fraction (EF)	15, 16	17, 19	19, 22	XY	14	28, 31.2	12, 18	12, 13 **10**	11, 14	8, 10
Swab #1 sperm fraction (SF)	15, 16	17, 19	**18.2, 21** 19, 22	XY	14, **15**	18, 32.2 **29**	**16, 20**	12, 13 **10**	11, 14 **12**	8, 10
Swab #2 EF	15, 16	17, 19	--	XY	14	28, 31.2	--	12, 13	11, 14	--
Swab #2 SF	15, 16	17, 19	**18.2, 21** 19, 22	XY	14, **15**	28, 31.2 **29, 32.2**	12, 18 **16, 20**	12, 13 **10**	11, 14 **12**	8, 10
Victim	15, 16	17, 19	19, 22	XY	14	28, 31.2	12, 18	12, 13	11, 14	8, 10

The alleles that Mr. Chu found in the evidence samples that are foreign to the victim are in boldface. As reflected in the above chart, all of the alleles found in the four "face-cheek" swab samples that are foreign to the victim are consistent with Mr. Napper's DNA profile. Our overall assessment of Mr. Chu's DNA testing in this case is that he developed clean, interpretable profiles from the four evidence samples that he tested.

---

250 This affidavit was prepared in connection with Mr. Napper's post-conviction *habeas* proceedings.

However, there is a major problem with how Mr. Chu reported his DNA results in this case. In his report dated March 30, 2001, Mr. Chu stated that "[a] mixture DNA type consistent with [the victim] and Lawrence Napper was detected on the face/cheek swab." Mr. Chu went on to state that, "[g]iven the population on the face of the earth and eliminating the probability of identical twins, the DNA profile statistically matches only Lawrence Napper."[251] Mr. Chu did not provide any frequency estimate in support of this conclusion.

These two statements in the report are contradictory, and Mr. Chu's statistical statement is incorrect and misleading. Because, as reflected in the above allelic table, Mr. Chu found a mixture DNA profile (primarily in the sperm fractions of both of the "face/cheek" swabs), Mr. Chu's statement indicating that there was a sole source match to Mr. Napper's DNA profile is completely inappropriate. Moreover, although Mr. Chu provided no statistics in his report, the Popstats data contained in the file shows that Mr. Chu calculated the frequency estimate in this case based on Mr. Napper's known profile, which was the usual -- and extremely flawed -- practice in the Crime Lab, even in mixture cases such as this. Our calculation of the random match probabilities in this case, based on Mr. Chu's STR data, is 1 in 232,000 in the African American population, 1 in 1,920,000 in the Caucasian population, and 1 in 7,430,000 in the Hispanic population. While these are relatively strong results given the nature of the sample in this case, they are a far cry from the sole source, unique match that Mr. Chu reported.

The other major problem with the Crime Lab's work in this case is Mr. Chu's consumption of the sample through testing. In an affidavit prepared in June 2005, Mr. Chu acknowledged that the DNA quantitative analysis he performed indicated that there was "only a very low concentration of human DNA present in the samples," which is not surprising given that the samples were swabs taken from the victim's face after he had bathed. Mr. Chu stated that, in fact, "because the concentration was so low, I did not expect to be able to develop a profile from the sample."

Despite the low concentration of DNA present on the swabs and having two swabs with which to work, Mr. Chu typed the extracts from both swabs and his tests consumed all of the liquid extract for all four samples (the epithelial and sperm fraction samples from both swabs). Mr. Chu acknowledged in his affidavit that "[t]here was no liquid DNA extract left in the tubes after I performed these analyses." As discussed below, outside laboratories have tried, with mixed results, to re-test the DNA evidence

---

251 A draft of the Crime Lab report found in the file shows that Christy Kim and Raynard Cockrell both reviewed Mr. Chu's draft report and provided handwritten comments regarding its wording. One handwritten suggestion that the reviewers provided was the insertion of the word "only" to the match statement.

from the two "face-cheek" swabs by performing re-suspensions in order to capture DNA that may be in residue inside the four tubes that contained the DNA extracts originally analyzed by Mr. Chu. While the outside laboratories have been able to obtain some results, they do not approach the strength of the Mr. Chu's original results. Given the nature of these samples, it was unnecessary and inappropriate for Mr. Chu to have tested the extracts from both swabs, thereby consuming the available sample in this case. This misstep was compounded by the fact that, as she acknowledged during her trial testimony, Ms. Childs-Henry discarded the tubes containing the raw evidence (the swabs) after she performed the DNA extractions on the two swabs.[252]

C. Mr. Napper's Trial

In advance of trial, Mr. Napper's counsel, Steven Greenlee, filed a Motion to Preserve and for an Independent Analysis of Semen and Fibers.[253] On May 14, 2001, the court granted the motion to allow for independent testing of the DNA evidence in Mr. Napper's case. That day, the prosecutor, Di Glaeser, contacted Ms. Hilleman at the Crime Lab and advised her that Mr. Napper's counsel wanted the DNA evidence subjected to an independent analysis. According to an affidavit prepared by Ms. Glaeser, "[l]ater that day, Joseph Chu, also with the Houston Police Department Crime Lab, called me back and told me that there was no DNA evidence left to test because it had been used up in the analysis."[254] As discussed above, Mr. Chu's affidavit states that he believed that there was no DNA left to be tested because all four extract tubes related to the swab samples were empty of liquid after he completed his testing. Accordingly, no independent testing of the DNA evidence in this case was performed in advance of Mr. Napper's trial.

In November 2001, Mr. Napper was tried on charges of aggravated sexual assault and aggravated kidnapping. On November 7, 2001, both Ms. Childs-Henry and Mr. Chu testified about their DNA work in the case. In his trial testimony, Mr. Chu testified about his DNA results and extended the incorrect and misleading conclusion

---

252 *Napper*, Tr. Vol. 8 at 206:11-17.

253 In August 2001, the Crime Lab requested that the Texas DPS crime laboratory in Austin compare the color of fibers obtained from the victim's clothing with the color of the comforter seized from the suspect's house. On September 10, 2001, the DPS laboratory issued a report concluding that "[a] green cotton fiber . . . recovered from the victim's clothing is similar in color to the green cotton fibers of the suspect's comforter. It is our opinion that this green cotton fiber recovered from the victim's clothing could have come from the suspect's comforter."

254 Ms. Glaeser's affidavit is consistent with the telephone log in the Crime Lab's case file. An entry on the log dated May 14, 2001 states: "Di Glaeser says Napper's att. wants DNA + fibers subjected to independent analysis. No DNA left."

stated in his report that a unique DNA profile matching Mr. Napper's DNA profile was found in the "face-cheek" samples. Specifically, Mr. Chu testified as follows:

> Q: And can you tell us what the results were of the comparison of the known DNA from the defendant to the semen that you recovered from the swab and extracted DNA from?
>
> A: Actually, the DNA final, evidence, [sic] the other half of the DNA is consistent with Mr. Napper's DNA.
>
> Q: Okay. So we know that part of it is the victim's . . . and the other part, the unknown part remaining belongs to the defendant; is that correct?
>
> A: That's correct.
>
> * * *
>
> Q: Can you tell us what the results of your finding was? How do you go about calculating the DNA results?
>
> A: The final steps, after all [sic] everything we have to do statistic [sic] to see how frequent that DNA type occurs in the general population based on different races.
>
> Q: Okay.
>
> A: And I conducted that after March 1st.
>
> Q: And based on this statistical analysis of the DNA in this case, what is your determination statistically?
>
> A: Statistically, it's -- DNA found on the evidence is matched with Mr. Napper. The number is about human population on the earth [sic].[255]

In light of this testimony, it would seem that the jury had little choice but to convict Mr. Napper, and they did. On November 9, 2001, the court adopted the jury's recommendation and sentenced Mr. Napper to life in prison on both counts against him. Mr. Napper currently is challenging his convictions in *habeas* proceedings.

---

255 *Napper*, Tr. Vol. 8 at 243:3-244:7.

D. Re-Testing by Outside Laboratories

Two outside laboratories, ReliaGene Technologies in New Orleans and Orchid Cellmark in Dallas, have attempted re-testing of the DNA evidence in Mr. Napper's case, with mixed results. Although the re-tests have developed some information that is consistent with Mr. Napper's DNA profile, the results are much weaker than those developed by Mr. Chu. Because the testing conducted by Ms. Childs-Henry and Mr. Chu effectively consumed the DNA samples from the "face-check swabs" in this case, the outside laboratories were forced to attempt re-testing based on re-suspensions in solution of residual DNA that may be present inside the four "face-cheek" swab extract tubes. Neither laboratory has been able to confirm the alleles consistent with Mr. Napper's DNA profile that Mr. Chu detected in the sperm fractions of each of the swabs, which captured most of the consistency between evidence profiles and Mr. Napper's DNA profiles.

On May 18, 2004, ReliaGene reported that its testing of the sperm fraction samples for each of the swabs "produced no result due to insufficient or excessively degraded DNA." Although ReliaGene detected "[t]wo weak alleles . . . consistent with the DNA extracts from the suspect Laurence [sic] Napper" in the epithelial fraction of the first swab, the laboratory concluded that, "due to the limited amount of information, no further conclusion can be drawn" based on its testing of this sample.

On August 31, 2005, Orchid Cellmark reported its results obtained from re-testing the "face-cheek" swabs: The "DNA profile obtained from the epithelial fraction of the tubes of DNA extract" for the first "face-cheek" swab "is a mixture." Orchid Cellmark found that the major profile in the mixture "matches the victim" and that "[t]he suspect cannot be excluded as a possible donor of the minor alleles in this mixture." Orchid Cellmark's frequency estimate for the partial profile found in this sample that was consistent with Mr. Napper's DNA profile was 1 in 255 in the African American population, 1 in 3,427 in the Caucasian population, and 1 in 585 in the Hispanic population. Probably due to the substantially diminished quality of the sample available for re-testing, these results are much less powerful than Mr. Chu's original STR results.

E. Conclusions

Although Mr. Chu's STR testing appears to have generated good quality and clear results from potentially very difficult forensic evidence samples, the Napper case illustrates two significant problems with the Crime Lab's historical DNA work.

First, Ms. Childs-Henry's and Mr. Chu's consumption of all of the readily testable sample in this case was unnecessary and was the product of very poor

laboratory practice. Although Mr. Chu averred that he did not "consume all of the extract in this case out of carelessness or out of a desire to prevent additional testing," there was no need, and it was a mistake, for him to consume both of the redundant "face-cheek" swabs.

Second, Mr. Chu's written conclusion and testimony that the mixture profile he found in the "face-cheek" swabs "statistically matches" Mr. Napper is internally contradictory and completely inappropriate. Mr. Chu's report and testimony almost assuredly created the impression with jurors that Mr. Napper was the only person on earth who could have contributed the DNA taken from the victim's face, which is a conclusion not supported by the actual DNA results.

II. George Rodriguez

On February 24, 1987, a 14-year-old girl was approached by two men in a car and abducted. The kidnapping was witnessed by a 16-year-old male friend of the victim who was with her at the time. The two men took the girl to a house where she was repeatedly raped. The victim was then blindfolded, driven away from the house, and left by the side of a road. She walked to a nearby gas station, and the police were called. The victim was transported to a hospital where she gave a statement to the police describing the abduction, both of her assailants, and the exterior of the house where the rape occurred.

A. The Investigation

From the victim's description of the location of the house and her description of the physical characteristics of the assailants, HPD officers quickly identified Manuel Beltran and George Rodriguez as potential suspects. Investigators believed Mr. Beltran met the victim's description of a "skinny" attacker and that Mr. Rodriguez, with whom HPD officers had dealings on prior occasions, matched the victim's physical description of the "fat" assailant.

On February 25, 1987, officers had both the victim and the male witness review two photograph spreads. One spread included a picture of Mr. Rodriguez, and the other included a picture of Mr. Beltran. The victim identified Mr. Rodriguez and Mr. Beltran as her attackers. The male witness identified Mr. Rodriguez, but he was unable to make any identification based on the photo array that included Mr. Beltran.

The next day, on February 26, 1987, HPD officers secured arrest warrants for Mr. Rodriguez and Mr. Beltran, as well as a search warrant for Mr. Beltran's residence. When officers arrived at Mr. Beltran's residence, they found Mr. Beltran and his brother, Uvaldo Beltran. The police separated the brothers and questioned them about

the assault. Manuel Beltran told officers that he had not seen Mr. Rodriguez in a while and that a man named "Isi," who looked similar to Mr. Rodriguez, had forced Mr. Beltran to abduct the victim. In another room, Uvaldo Beltran told police that his brother and Isi had brought the victim into Manuel Beltran's house. The Beltran brothers subsequently identified Isidro Yanez as "Isi," and they provided written statements to the police.

In the same police report discussing Mr. Beltran's confession and both brothers' identification of Mr. Yanez as the second assailant, investigators noted that they "also pursued information regarding the co-defendant of Manuel Beltran, Mr. Rodriguez, and obtained information leading officers to believe Mr. Rodriguez may not have been responsible for these offenses. The most important evidence indicating nonculpability was Mr. Rodriguez's work record indicating he was in fact at work during the entire time span of this incident. Thus, officers did not execute the arrest warrant for Mr. Rodriguez, but they noted that, since there were two positive photo identifications of Mr. Rodriguez (by the victim and by the male witness), they would contact Mr. Rodriguez and ask him to participate in a line-up.

On March 10, 1987, Mr. Rodriguez voluntarily appeared in a line-up with five inmates from the City Jail. The victim, for the second time, identified Mr. Rodriguez as one of her assailants. Mr. Rodriguez provided HPD with samples of hair and saliva that were then submitted to the Crime Lab. The next day, investigators contacted Crime Lab trace evidence examiner Reidun Hilleman to check on the results of her comparison of hairs found on the victim and at the crime scene with those provided by Mr. Rodriguez. Ms. Hilleman told the officers that she had not completed her examination, but that at that point she had not found that any hairs collected from the crime scene appeared to have come from Mr. Rodriguez.

On April 8, 1987, a prosecutor informed investigators that Mr. Yanez had been implicated in the separate abduction and rape of two adult women. In those cases, the victims were kidnapped and taken to a residence where they were raped. After receiving information about the similarities between these crimes, investigators advised the prosecutor that they "considered Yanez a viable suspect in the rape of this complainant. Even though there has [sic] been positive identifications of George Rodriguez there is enough doubt of his culpability to not rush into an indictment situation. The doubt stems from similar appearance and reputation in the community . . . there was sufficient doubt that officers have kept an open mind and have tried to assemble more tangible evidence."

Approximately two weeks later, investigators noted that the time limit for comparing known hair reference samples to the evidence samples from the victim and the crime scene was approaching because human hair is fully replaced in the hair

growth process every three to four months. Therefore, officers redoubled their efforts to locate Mr. Yanez. Although Mr. Yanez misled officers by claiming to be his brother, investigators confirmed his identity through fingerprints. Mr. Yanez denied being involved in the kidnapping and sexual assault of the victim, although he provided information indicating that he was familiar with the crime. After his interview with investigators, Mr. Yanez was taken to the Crime Lab where hair, saliva, and blood samples were taken. Mr. Yanez was held based on two outstanding traffic warrants.

HPD investigators re-interviewed the victim hoping to resolve whether Mr. Rodriguez or Mr. Yanez likely was the second assailant. After reviewing a photo spread of approximately 100 Hispanic males, the victim focused on the photographs of Mr. Rodriguez and Mr. Yanez. After noting that Mr. Rodriguez and Mr. Yanez had similar physical appearances, the victim identified Mr. Rodriguez as one of her assailants for a third time. On May 1, 1987, HPD officers arrested Mr. Rodriguez.

B. The Crime Lab's Work

Investigators submitted two types of evidence to the Crime Lab. First, they submitted a large number of hairs collected from the victim's clothing and the crime scene, including hairs from the victim's "panties," as well as known reference samples from the victim and from Messrs. Beltran, Rodriguez, and Yanez. Second, investigators requested that the Crime Lab perform serology testing on vaginal and rectal swabs and smears from the victim's sexual assault kit as well various items of clothing, including a pair of "white panties" and "pantyhose," and reference samples from the victim and suspects. Ms. Hilleman performed the hair comparisons, and Christy Kim performed the serology testing.

1. Hair Comparisons

On May 11, 1987, Ms. Hilleman issued a written report reflecting the results of the hair examinations and comparisons that she performed in the Rodriguez case. Ms. Hilleman found that "the hairs from the complainant's panties are two pubic hairs microscopically consistent with the known pubic hairs of the complainant and one pubic hair microscopically consistent with known pubic hair of G. Rodriguez." She also reported finding "several head hairs microscopically consistent with the known head hairs of M. Beltran." Ms. Hilleman determined that the remaining hairs collected from the crime scene and the victim's clothing were "unsuitable for comparison purposes."

Forensic hair comparisons involve an examiner looking at hairs under a microscope to evaluate the similar and varying characteristics between hairs. Because this type of examination is less definitive than other types of forensic examinations, trace evidence examiners must be careful to report their findings appropriately so that

any association between a suspect reference sample and an evidentiary hair sample is not overstated. For example, it generally would be inappropriate for a trace evidence examiner to report that an unknown hair and the suspect's hair "matched" because hair comparisons usually cannot support such individualized associations and definitive findings.

In this case, it does not appear that Ms. Hilleman's report overstated the significance of the association she made between the hair collected from the victim's panties and the reference sample obtained from Mr. Rodriguez. In her written report, Ms. Hilleman used the appropriate phrase "microscopically consistent" to describe the comparison of Mr. Rodriguez's hair to the unknown hair. While the absence of charts and illustrations such as sketches or photomicrographs detailing the actual comparison made it impossible for us to recreate her observations, Ms. Hilleman's notes described the hair characteristics she found in a manner typically used by hair examiners and consistent with generally accepted forensic science principles followed during that period.[256] As discussed below, Ms. Hilleman appropriately described the limits of her observations and interpretation in her trial testimony.

Ms. Hilleman's assessment and testimony that a pubic hair found in the underwear of the rape victim was microscopically consistent with the known pubic hair of Mr. Rodriguez was later undermined by DNA testing. In 2004, an outside laboratory performed mitochondrial DNA testing on this hair and found that it could not have come from Mr. Rodriguez. This contradiction likely is more a reflection of the limitations of microscopic hair comparison as practiced in the late 1980s than of errors in Ms. Hilleman's examination.

2. Serology

In her report dated September 24, 1987, which was marked as State's Exhibit 69 during Mr. Rodriguez's trial, Ms. Kim reported that "semen was detected on the rectal smear, rectal swab, white panties, and pantyhose" samples submitted to the Crime Lab. She reported that ABO type A activity was detected on the swab, panties and

---

256 We found some disparity between the thoroughness of Ms. Hilleman's notes relating to the known samples as compared to the questioned samples. While the work notes contained detailed observations of microscopic characteristics of the known hairs from the suspects and victim, she did not record her observations with respect to the questioned hairs with the same level of detail. Instead, Ms. Hilleman only noted whether the questioned hairs were microscopically consistent with the known hairs. There also appear to be a few discrepancies in the dating of Ms. Hilleman's work notes.

pantyhose. She also reported the following ABO types and secretor status for the victim and each of the suspects in this case:

Victim	ABO type O non-secretor
Isirdo [sic] Yanez	ABO type O secretor
Manuel Beltran	ABO type A secretor
George Rodriguez	ABO type O non-secretor

Based on these ABO types and secretor status findings, Ms. Kim concluded that "suspects Beltran and Rodriguez could have contributed the semen on the rectal swab, panties, and the pantyhose." Although her report does not include an explicit conclusion with respect to Mr. Yanez, she omitted him as a potential contributor and thus, by inference, excluded him as a potential semen donor.

Ms. Kim's exclusion of Mr. Yanez as a potential contributor to the semen evidence in this case was incorrect and was based on a fundamental misinterpretation of the ABO typing and Lewis secretor testing results that Ms. Kim reported obtaining. Based on her serology results, Messrs. Beltran, Rodriguez, and Yanez all should have been included as possible donors.

Ms. Kim may have reasoned that Mr. Yanez, as a type O secretor, could be excluded as a semen contributor from the two-assailant sexual assault scenario because she detected only ABO type A activity -- and no ABO type O activity -- in the semen evidence. Such reasoning reflects a fundamental misunderstanding of basic serology principles. Because ABO type O antigens are a precursor to ABO type A and B antigens, some level of ABO type O activity is present in *every* sample that includes ABO antigenic activity. In light of this basic scientific fact, a serologist could never eliminate an ABO type O secretor, such as Mr. Yanez, as a possible contributor in a scenario involving more than one contributor to an evidence sample.[257] Indeed, most of the male population could not be eliminated as a potential contributor to the semen evidence in this case based merely on ABO typing.[258]

Mr. Yanez, as an ABO type O secretor, could not be eliminated as a potential contributor to the semen evidence in this case, nor could Mr. Rodriguez be eliminated as a potential donor in light of his non-secretor status. Non-secretors do not express

---

257 If there were only one potential contributor to an evidence sample that demonstrated, for example, ABO type A activity, then an ABO type O secretor could be eliminated as a possible contributor because he could not have been the source of the ABO type A activity in the evidence.

258 Only ABO type B secretors or ABO type AB secretors could be excluded as potential contributors to the evidence in this case, which constitute a relatively small percentage of the population.

their ABO type in body fluid secretions such as semen. Because he was found to be a non-secretor, Mr. Rodriguez could *never* be eliminated as a potential contributor to a semen positive sample in a multiple donor scenario. While Ms. Kim was correct to include Mr. Rodriguez based on his non-secretor status, she provided absolutely no information in her report about the relative insignificance of this inclusion.[259]

While the analytical flaws we identified in this case are disturbing, they are typical of what we found -- and have described at length in this report -- in the Crime Lab's serology work going back to the early 1980s. By the time the Rodriguez case went to trial, Mr. Bolding had been with the Crime Lab for nine years and was the supervisor of the Serology Section. He was responsible for training and supervising Ms. Kim, who had been with the Crime Lab for more than three years. This case and many others that we reviewed demonstrate that serologists in the Crime Lab during the 1980s -- including Mr. Bolding and Ms. Kim -- simply did not grasp basic technical and interpretive principles of forensic serology.

C. Mr. Rodriguez's Trial

Mr. Rodriguez's trial began on October 26, 1987. In his opening statement, the prosecutor told the jury that the Crime Lab's work would play a central role in the trial because the serology evidence contradicted Mr. Rodriguez's defense that Mr. Yanez actually was the second assailant.[260] The prosecutor told the jury: "You will hear scientific evidence which shows that beyond a doubt Isidro Yanez could not have committed the offense, and you will hear scientific evidence that there is physical evidence that is consistent with the defendant committing the offense."[261]

---

259 On October 1, 1987, Ms. Kim entered a version of her lab report into the OLO system. There are a number of discrepancies between the report entered into OLO and Ms. Kim's original typewritten report dated September 24, 1987. The most significant of these discrepancies is that, in the October 1 report, Ms. Kim identifies Mr. Rodriguez to be a "type 'O' Lewis secretor." While this may have been a typographical error made while entering the report into OLO, the irony is that, if Ms. Kim actually had concluded that Mr. Rodriguez was an ABO type O secretor, she probably would have eliminated him (incorrectly) just as she eliminated Mr. Yanez. Based on the test data that Ms. Kim recorded in her notes, it is not possible to state with confidence whether Mr. Rodriguez actually is a secretor or not.

260 *Texas v. Rodriguez*, Cause Nos. 474772, 474773 (230th Dist. Ct. Harris County, TX). Mr. Beltran was tried separately.

261 *Rodriguez* Tr. at 6:15-20 (Oct. 26, 1987).

1. Testimony Regarding the Hair Comparison

Ms. Hilleman testified that one hair from the victim's panties was consistent with the known pubic hairs of Mr. Rodriguez. She testified that all of the characteristics present in the hair found in the victim's panties were also present in the sample acquired from Mr. Rodriguez.[262] Ms. Hilleman, however, appropriately acknowledged that hair examination is not like fingerprint examination because "hairs are not personally identified."[263] On cross-examination, when asked by counsel for Mr. Rodriguez whether she could state that the hair found in the victim's panties definitely came from Mr. Rodriguez, Ms. Hilleman again acknowledged that she could not do so:

> Q And it again is not conclusive?
>
> A No, it is not a personal identification of George Rodriguez. That's correct.[264]

2. Testimony Regarding the Serology Results

At the time of Mr. Rodriguez's trial, Ms. Kim was on maternity leave. Therefore, Mr. Bolding testified at trial about the serology work performed and reported by Ms. Kim. In addition, the prosecution introduced Ms. Kim's September 24, 1987 report into evidence. As discussed above, this report included Messrs. Beltran and Rodriguez as potential contributors to the semen evidence found on the victim's rectal swab and clothing, but incorrectly excluded Mr. Yanez as a potential donor to the evidence.[265]

Mr. Bolding's testimony perpetuated Ms. Kim's fundamental error in excluding Mr. Yanez. Mr. Bolding testified that neither the victim nor Mr. Rodriguez could be eliminated as possible contributors of the body fluid found on the victim's pantyhose and panties as well as on the swab.[266] Mr. Bolding also testified that Mr. Beltran could not be eliminated as a possible contributor of the semen found on the victim's clothing

---

262 *Rodriguez* Tr. at 544:14-16 (Oct. 28, 1987).

263 *Id.* at 540:14-16.

264 *Id.* at 543:22-24.

265 *Id.* at 383:11-23.

266 *Id.* at 386:9-25.

and swab.[267] However, with regard to whether Mr. Yanez could have been one of the donors to the semen, Mr. Bolding had this exchange with the prosecutor:

> Q Okay, and is he a possible donor of that semen?
>
> A No, sir, he is not.
>
> Q And would you tell the jury why, please?
>
> A Again, because he is a secreter [sic] and the grouping would be O, one would predict his genetics would show up as a donor in a sexual assault or intercourse. None of those O secretions did show up by the testing by Ms. Kim.[268]

In response to a question from Mr. Rodriguez's attorney on cross-examination, Mr. Bolding reiterated that Mr. Yanez was not a donor to the evidence found on the victim's clothing and the swab.[269]

The jury did not accept Mr. Rodriguez's defense that he was at work during the time of the kidnapping and assault of the victim and that Mr. Yanez was the real second assailant. On October 29, 1987, the jury found Mr. Rodriguez guilty of aggravated kidnapping and aggravated sexual assault. Mr. Rodriguez was sentenced to 60 years in prison for the aggravated kidnapping and aggravated sexual assault charges and 10 years in prison for a previous burglary offense for which he had been on probation at the time of the offense.

D. Post-Conviction Testing and Exoneration

None of Mr. Rodriguez appeals were successful. In 2002, the Innocence Project began representing Mr. Rodriguez in the *habeas* proceedings challenging his conviction. Most of the evidence in this case was destroyed in 1995. However, the pubic hair found in the victim's underwear that Ms. Hilleman reported to be consistent with Mr. Rodriguez's hair had been preserved. Therefore, when Mr. Rodriguez successfully petitioned for post-conviction DNA testing, an independent lab, through mitochondrial DNA analysis, was able to compare the DNA of that hair to Mr. Rodriguez's DNA.

---

267 *Id.* at 387:9-10.

268 *Id.* at 388:5-13.

269 *Id.* at 393:15-21.

In May 2004, an independent lab reported that Mr. Rodriguez was not a possible contributor to the hair retrieved from the victim's underwear. Furthermore, in July 2004, that same independent lab reported that through DNA testing it was found that Mr. Yanez could not be excluded as a contributor to the hair recovered from the victim's underwear.

In addition to the DNA tests establishing that Mr. Rodriguez's hair was not found in the victim's underwear and that the hair could have come from Mr. Yanez, an outside review of the Crime Lab's serological analysis of semen found on the victim's swab and clothing showed that the Lab was wrong to have excluded Mr. Yanez as a possible contributor of the semen. On August 5, 2004, Mr. Rodriguez's counsel filed an affidavit prepared by a panel of six serological experts.[270] In their affidavit, the panel of experts stated that Mr. Bolding's testimony contained "egregious misstatements of conventional serology" revealing that "either the witness lacked a fundamental understanding of the most basic principles of blood typing analysis or he knowingly gave false testimony to support the State's case against Mr. Rodriguez." The panel found that there was no scientific basis for Ms. Kim's findings and Mr. Bolding's testimony excluding Mr. Yanez as a possible contributor to the semen.

In October 2004, after Mr. Rodriguez had served 17 years of his sentence, he was released from prison on the grounds that he had been denied due process during his 1987 trial. The Texas Court of Criminal Appeals subsequently vacated Mr. Rodriguez's convictions and remanded the case for a new trial. On September 29, 2005, the district attorney dismissed the charges against Mr. Rodriguez.

This case remains the subject of litigation. On August 14, 2006, Mr. Rodriguez's attorneys filed a complaint in federal court in Houston. The complaint names as defendants the City of Houston, Harris County, the current District Attorney for Harris County, Mr. Bolding, Ms. Kim, Ms. Hilleman, and a number of other individuals. Mr. Rodriguez seeks unspecified damages as a result of his wrongful conviction.

E. Conclusion

Flawed serology work and testimony were central to Mr. Rodriguez's conviction. Based on seriously problematic serology analysis that reflected a failure to grasp fundamental serologic principles, Ms. Kim incorrectly excluded Mr. Yanez, whom investigative leads and Mr. Rodriguez's defense pointed to as the likely real

---

270 The panel was made up of the following six experts: Dr. Edward Blake, Pamela Newall, Dr. George Sensabaugh, Dr. Robert Shaler, Ronald Singer, and Mark Stolorow. Mr. Stolorow is also a member of our investigative team of experts.

perpetrator. While the Crime Lab was not incorrect in finding that its serology analysis could not eliminate Mr. Rodriguez as a potential contributor to the biological evidence, it provided no information regarding the significance of Mr. Rodriguez's inclusion -- which was minimal because most of the male population could not be eliminated as a potential contributor to the evidence in this case based merely on ABO typing.

III. Josiah Sutton

At approximately 11:00 p.m. on October 25, 1998, a 41-year-old female hospital worker pulled her Ford Expedition into the parking lot in front of her apartment complex as she returned home from work. After gathering her things, she opened the driver's side door of her truck and was confronted by a man with a gun. The man ordered her to move over to the passenger seat, and he climbed into the driver's seat. A second assailant then entered the truck through the passenger side rear door and got into the middle row of seats. The attackers then drove the truck out of the parking lot, abducting the woman and demanding cash with a gun pointed at her head.

Eventually the assailants stopped the truck on a side street, and a second car carrying two men pulled alongside. The female hospital worker told investigators that the men referred to the first assailant, who was wielding a gun, as "Deke." "Deke" forced the victim into the truck's middle row of seats where he raped her. The victim reported that she believed that he ejaculated during the sexual assault. "Deke" then returned to the driver's seat, and the second assailant got into the middle row of seats with the victim. As they began driving again, the second attacker also sexually assaulted the victim, although she reported that she was unsure whether he ejaculated. The victim told investigators that they drove "for a long time," and then her attackers forced her out of the truck on a back road and drove away in her truck. The victim made her way to a main road and attempted to flag down a passing car. Police arrived, and she was transported by ambulance to a hospital.

A. The Investigation

HPD officers arrived at the hospital to meet with the victim in the early morning hours of October 26, 1998. The victim that morning provided officers with an initial description of the kidnapping and sexual assault, and a sexual assault kit was collected. An HPD officer retrieved the sexual assault kit, as well as articles of the victim's clothing, from the hospital early that morning and checked the evidence into HPD's Property Room.

On October 28, 1998, the victim submitted a sworn statement to an HPD sex crimes investigator. She recounted the brutal assault and described her two assailants. She described the first attacker, who was called "Deke," as a black male, approximately

20 years old, 5 foot 7 inches tall, and 135 pounds. She told investigators that he wore a baseball cap. The victim described the second attacker as a black male, also about 20 years old, approximately 5 feet 8 inches tall, and "real thin." Among other things, she told investigators that the second attacker wore a "wool cap."

Two days later, on October 30, 1998, the victim flagged down a passing HPD patrol car. She reported to the HPD patrol officer that, as she was driving near her residence, she spotted three males walking by, two of whom she believed were the men who had kidnapped, robbed, and sexually assaulted her days before. She told the officer that she recognized two of the men as her attackers because both of these men were black and one was wearing a baseball cap while the other was wearing a "skull cap" -- which was similar to her description of the assailants on the night of the attack. The three men included Josiah Sutton, who was a 16-year-old juvenile at the time, and Gregory Adams. The victim told the officer that she was 100% sure that Mr. Sutton and Mr. Adams were the men who had attacked her. Based on the victim's positive identification, both Mr. Sutton and Mr. Adams were arrested. The next day, the victim told an investigator that she recognized Mr. Sutton because of his "baby face" and he was wearing a cap. She told the investigator that Mr. Sutton was the suspect who drove her truck and was called "Deke." She identified Mr. Adams because he was wearing a wool skull cap and was tall and skinny, and she told the investigator that she was "very sure" that Mr. Adams was the suspect who rode in the back of the truck during the assault.

HPD recovered the victim's truck, and it was examined for evidence by an officer from CSU. The CSU investigator found an unknown stain, which he identified as a possible semen stain, on the truck's middle row bench seat, which is where the victim had been sexually assaulted. The CSU investigator took a sample of the stain using a cotton swab moistened with saline solution and also took a control sample from the seat. He also performed tape lifts of the middle row bench seat to collect possible hair and fiber evidence.

B. The Crime Lab's Work

On November 17, 1998, the Crime Lab received various items of evidence relating to the case, including the victim's sexual assault kit, the swabs collected from the middle seat of the victim's truck which were identified as "control swabs" and "sample #1 swabs," and articles of clothing including the jeans that the victim wore on the night of the kidnapping and assault. In January 1999, investigators also submitted to the Crime Lab reference samples from the victim, Mr. Sutton, and Mr. Adams.

On February 8, 1999, Crime Lab serologist Shae Quiroz reported that she had detected semen on the vaginal smear and swabs and pubic hair combings from the

victim's rape kit as well as on the "sample #1 swabs" from the middle seat of the truck and on the victim's jeans. According to Ms. Quiroz's worksheets, these findings were based on positive p30 test results she obtained on each of these items. She also performed a microscopic examination of the victim's vaginal smear and recorded finding "numerous intact sperm." Finally, Ms. Quiroz reported that the vaginal smear and swabs, pubic hair combings, "sample #1" swabs, cutting from the victim's jeans, and reference samples from the victim, Mr. Adams, and Mr. Sutton were retained by the Crime Lab for further analysis. On February 18, 1999, she transferred these items to Christy Kim for DNA analysis.

Ms. Kim analyzed the evidence in the Sutton case prior to the introduction of STR testing in the Crime Lab. Accordingly, the PCR-based DNA analysis systems used by the Crime Lab were DQ Alpha, Polymarker, and D1S80. As discussed above in our review of the Crime Lab's historical DNA work, the Lab -- and Ms. Kim in particular -- had significant problems obtaining reliable and interpretable DNA results using these systems. The Sutton case illustrates several of the technical and interpretive problems that the Crime Lab commonly experienced with PCR-based testing.

1. Ms. Kim's DNA Results

In February 1999, Ms. Kim performed DNA testing on the evidence and reference samples in the Sutton case. Ms. Kim used the DQ Alpha and Polymarker systems to perform DNA typing on the reference samples from the victim, Mr. Sutton, and Mr. Adams as well as on the vaginal swab and pubic hair combings from the sexual assault kit, the "sample #1" swabs from the truck, and the cutting from the victim's jeans. Ms. Kim performed D1S80 testing only on the vaginal swab and pubic hair combing samples from the sexual assault kit.

Ms. Kim found complex mixture profiles -- meaning DNA profiles reflecting multiple contributors -- in all of the evidence samples, including in the epithelial and sperm fractions of the vaginal swab and pubic hair combings samples even though she performed a differential extraction procedure on these samples. Because Ms. Kim's lab notes do not indicate that she performed testing on separate epithelial and sperm fraction samples obtained from the stain on the victim's jeans and from "sample #1," it does not appear that Ms. Kim attempted any differential extraction on those samples. The victim's profile appears to be present in all of the evidence profiles, including the sperm fractions from the vaginal swab and pubic hair combings samples.

On June 6, 1999, Ms. Kim reported that "a mixture of DNA types consistent with J. Sutton, [the victim] and at least one other donor was detected on the vaginal swabs,

unknown sample #1, debris from the pubic hair combings, and the jeans based on PM, DQA1, D1S80 typing results."[271] As was typical for the Crime Lab, Ms. Kim's report did not include an allelic table illustrating the exact results she obtained for each item of evidence and reference sample she tested. Ms. Kim concluded her report with the statement: "The DNA type of J. Sutton can be expected to occur in 1 out of 694,000 people among the black population."[272]

2. Problems with Ms. Kim's DNA Analysis

Ms. Kim's DNA analysis in the Sutton case reflects a number of very serious technical, interpretation, and reporting errors, all of which contributed to faulty and misleading DNA evidence being used against Mr. Sutton at his July 1999 trial for aggravated sexual assault. Specifically, the following are the most significant problems that we identified with the work in this case:

- Ms. Kim failed to perform successful differential extractions (which are capable of separating sperm DNA from non-sperm or epithelial DNA) on evidence samples. As a result, Ms. Kim's DNA testing produced mixed DNA profiles that were more complicated to interpret than they would have been had the samples been properly extracted. Not only was the victim's profile present in almost all of the evidence profiles Ms. Kim obtained, but it also appeared to be the major profile even in the "sperm fraction" profiles from the vaginal swab and pubic hair combings. In addition, it appears that Ms. Kim failed to attempt a differential extraction at all on the jeans sample and "#1 sample."

- Ms. Kim obtained no DNA typing information that could be associated with Mr. Adams. While Ms. Kim's report does not state that Mr. Adams is included as a potential contributor to the mixture profiles, as it does with respect to Mr. Sutton, she does refer ambiguously to there being "at least one other donor" in addition to the victim and Mr. Sutton. Ms. Kim should have clearly and expressly excluded Mr. Adams based on her Polymarker, DQ Alpha, and D1S80 test results.

- Photographs of Ms. Kim's DQ Alpha test strips show that the control dot for the jeans sample and the positive control is not visible. Therefore, Ms. Kim should

---

271 Although Ms. Kim's DNA worksheets reflect that she analyzed the evidence in this case in February 1999, she did not enter her lab report into the OLO system until June 1999.

272 In a draft of her report that appears in the Crime Lab case file, Ms. Kim calculated a frequency estimate for Mr. Sutton's DNA type of "1 out of 6,940,000 people among the black population." It appears that this error was caught during a review of the case draft report.

have re-amplified the sample with more DNA and re-run the test. Even though Ms. Kim did not re-test the jeans sample, her report relies on these results to include Mr. Sutton as a potential contributor to the jeans sample.

- The DQ Alpha types detected in the "#1 sample" and the jeans sample show a slightly different profile than the DQ Alpha types that Ms. Kim found in the vaginal swab and pubic hair combings. In light of these differences, Ms. Kim should have performed D1S80 testing -- which is relatively more polymorphic and therefore more discriminating than Polymarker and DQ Alpha testing -- on the #1 sample and the jeans sample, but she did not. Instead, Ms. Kim performed D1S80 testing only on the samples that showed DQ Alpha types consistent with Mr. Sutton's DQ Alpha type -- the vaginal swab and the pubic hair combings. As discussed below, in 2003 an outside laboratory's re-testing of the #1 sample and a cutting from the jeans using STR technology excluded Mr. Sutton as the source of the DNA in those samples.

- Ms. Kim performed DQ Alpha typing on the victim's reference sample more than once and interpreted two different profiles -- DQA 3,3 and DQA 3,4.2/4.3.[273] Ultimately, it appears that Ms. Kim decided to use the DQ Alpha type 3,4.2/4.3 for the victim, which probably was the correct type. Ms. Kim likely obtained only a weak type 4.2/4.3 signal in one of the tests due to poor temperature control during the hybridization or wash step of the DQ Alpha typing assay. Poor temperature control has a more severe impact on the detection of the 4.2/4.3 allele than on some of the other alleles because this particular type has a "mismatch" to the target probes used in the DQ Alpha test strip.

- Ms. Kim's frequency estimate that the "DNA type of J. Sutton can be expected to occur in 1 out of 694,000 people among the Black population," if understood to reflect the strength of the association between Mr. Sutton's DNA profile and the DNA profiles that Ms. Kim detected on the evidence samples, is a grossly misleading overstatement. A more accurate frequency estimate, based on Ms. Kim's typing results for these mixture profiles, would be approximately 1 in 14 in the African American population.[274]

---

273 As discussed below, this issue of two DQ Alpha profiles for the victim was highlighted in a review of this case performed by an outside laboratory in January 2003.

274 As discussed above in the section regarding the Crime Lab's historical practices with respect to the calculation of random match probabilities, properly presented frequency estimates include statistics for all significant population groups without regard to the race of the suspect. Here, we

Footnote continued

There was no technical review of Ms. Kim's work in the Sutton case. In connection with HPD's internal investigation of the Sutton matter, Mr. Bolding stated that, even though he was the head of the DNA Section and its only supervisor, the job of reviewing the technical results of casework fell to analysts who, unlike himself, had been trained in PCR analysis. DNA analysts Joseph Chu and Raynard Cockrell both acknowledged reviewing the Sutton case, but stated that they performed only administrative-type reviews for issues such as spelling and grammar. Mr. Bolding acknowledged that at the time the Crime Lab did not have a written policy regarding technical reviews.

As discussed below, in early 2003, Professor William Thompson of the University of California at Irvine was asked to review the Crime Lab's work in the Sutton case.[275] He made many of the observations regarding Ms. Kim's work that we describe above, including Ms. Kim's failure to prepare an allelic table reflecting the exact typing results obtained from each of the PCR testing systems she used for each of the evidence and reference samples she tested, Ms. Kim's inconsistent DQ Alpha typing results for the victim's profile, and Ms. Kim's extremely misleading presentation of the significance of her DNA typing results.

Professor Thompson also suggests that the DQ Alpha results Ms. Kim obtained for the "#1 sample," if compared to the DQ Alpha profile she found in the vaginal swab and pubic hair combings evidence and for Mr. Sutton, should have resulted in the exclusion of Mr. Sutton as a potential contributor to that sample and therefore exclusion as one of the rapists. Professor Thompson illustrated this point using the following allelic table reflecting Ms. Kim's DQ Alpha results for these samples.

Footnote continued from previous page

include only the frequency estimate for African Americans to remain consistent with Ms. Kim's reported results.

275 Professor Thompson prepared a paper entitled "Review of DNA Evidence in State of Texas v. Josiah Sutton," dated February 6, 2003. In addition to speaking with us on two occasions, Professor Thompson provided us with a copy of this paper and other materials related to the Sutton case.

Sample	Kim's DQ Alpha Results
Sperm fraction of the vaginal swab ("VSF")	1.1, 2, 3, 4.1 (1.2)
Pubic hair combings	1.1, 2, 3, 4.1 (1.2)
#1 Sample	2, 3
Obligatory genotype of the second contributor to the VSF (assuming the donor of the #1 sample is one of the two male contributors)	1.1, 4.1
Josiah Sutton	1.1, 2

Professor Thompson opined that if the "#1 sample" is from one of the two men who sexually assaulted the victim and if the only potential male contributors to the sperm fraction of the vaginal swab were the assailants, then Mr. Sutton could be ruled out as one of the rapists based on Ms. Kim's DQ Alpha results reflected above. Professor Thompson subtracted the alleles found in the #1 sample (2, 3) from the mixture profiles in the vaginal swab and pubic hair combings to arrive at an "obligatory genotype" for the second male contributor -- 1.1, 4.1. Professor Thompson concluded that, because Mr. Sutton's DQ Alpha type is 1.1, 2 and not 1.1, 4.1, Mr. Sutton should be excluded as the second rapist.

For purposes of his analysis, Professor Thompson assumed that Ms. Kim's DQ Alpha results were reliable -- i.e., his analysis was based on conclusions the Crime Lab could have drawn from the DQ Alpha results reflected on Ms. Kim's test strips and in her DQ Alpha notes. We agree that, based on the DQ Alpha typing notes generated by HPD with respect to this single sample, Mr. Sutton is excluded as a potential contributor of the "#1 sample" because there is no indication of the 1.1 (or the 1) allele in Ms. Kim's typing strip for the "#1 sample", and Mr. Sutton has the 1.1 allele. However, Ms. Kim's DQ Alpha results for the "#1 sample" were very weak as reflected by the trace control dot signal on the test strip and fairly weak for the 2 allele. These weak results may be the result of the same poor temperature control during the hybridization or wash step in the DQ Alpha testing process, which, as discussed above, may have been the reason Ms. Kim obtained two different DQ Alpha profiles from the victim's reference sample in this case. The bottom line is that we would consider Ms. Kim's typing results for the "#1 sample" inconclusive, which is an example of Ms. Kim performing poor DNA testing on a potentially probative sample.

Finally, even if Mr. Sutton is eliminated as a source for the "#1 sample" based on Ms. Kim's DQ Alpha typing results, we would not go so far as to conclude that Mr. Sutton, therefore, should be eliminated as a possible source for the sperm fraction of the vaginal swab (considering only the Crime Lab's original PCR results). In cases of multiple assailants, such as this one, it is not uncommon for the PCR testing systems to detect different profiles in different evidence stains. Generally, it is necessary for a DNA analyst using the PCR testing systems to consider all of the profiles obtained from

all of the relevant stains to reach a comprehensive conclusion about the inclusion or exclusion of a potential donor. The nature of the PCR testing systems used by the Crime Lab in the 1990s required highly skilled analysts who were proficient in the testing techniques and experienced in interpreting the typing results in order to arrive at reliable conclusions. Ms. Kim was not such an analyst, nor was anyone else in the Crime Lab at the time.[276]

C. Mr. Sutton's Trial

In December 1998, Mr. Sutton was certified to stand trial as an adult for the aggravated sexual assault of the victim. After firing his first lawyer, Mr. Sutton's mother, Carol Batie, retained Charles A. Herbert, a local Houston attorney, to represent her son.[277] On April 23, 1999, the court entered an agreed order to permit independent DNA testing to be performed on the evidence in this case. The court directed the Crime Lab to release "any remaining DNA samples" to the private laboratory GeneScreen in Dallas, Texas so that GeneScreen "may complete an independent analysis of the DNA evidence . . . and make a final report to the attorney representing Josiah Sutton, the defendant herein." On May 13, 1999, the Crime Lab sent GeneScreen reference samples for the victim, Mr. Sutton, and Mr. Adams; the cutting from the victim's jeans; DNA extracts from the vaginal swab; "debris from pubic hair"; and "unknown sample #1." However, GeneScreen did not analyze the evidence. It appears that, even though Mr. Sutton's family gave Mr. Herbert at least $600 for the independent analysis and

---

276 In his report, Professor Thompson is suspicious of whether the prosecutor, Joseph Owemby, who tried Mr. Sutton knew that the "#1 sample" potentially exonerated Mr. Sutton and, therefore, purposely prevented Ms. Kim from discussing the sample during the trial. As discussed above, Ms. Kim did not prepare an allelic table in this case, and there is no evidence that Mr. Owemby prepared such a table himself or that he would have known how to do so. Therefore, it is unlikely that Mr. Owemby would have concluded, as Professor Thompson did, that the "#1 sample" may have excluded Mr. Sutton as one of the victim's attackers. Mr. Owemby has stated, and it is likely true, that he focused on the sexual assault kit evidence because that evidence appeared more persuasive of Mr. Sutton's guilt in light of Ms. Kim's results. In short, it appears that Mr. Owemby was uninterested in the "#1 sample" because it did not include Mr. Sutton, but is unlikely that he believed the DNA evidence from the "#1 sample" eliminated Mr. Sutton.

277 One the eve of trial, Mr. Herbert was joined by another attorney, Ronald G. Mock, in the representation of Mr. Sutton. Mr. Herbert told the *Houston Chronicle* that he believed Mr. Mock was good with juries, and so, when Mr. Mock offered to help with the trial, Mr. Herbert accepted. Mary Ann Fergus, *Josiah Sutton: One Year Late Waiting for Justice*, HOUSTON CHRONICLE (Mar. 6, 2004). Mr. Mock is well known in the Houston bar for his defective representation of defendants in capital cases. He currently is serving a three-year suspension from the practice of law for violation of various Texas State Bar ethics rules.

even though the Crime Lab forwarded the evidence to GeneScreen, Mr. Herbert never directed GeneScreen to go forward with the testing.[278]

Because Ms. Kim's DNA testing found no evidence connecting Mr. Adams to the sexual assault of the victim, the charges against Mr. Adams were dropped. Even though the man who allegedly participated in the attack with Mr. Sutton -- and who was identified with utter certainty by the victim when she saw him and Mr. Sutton together, one wearing a cap and the other wearing a skull cap, just as her attackers had been -- was cleared by Ms. Kim's DNA test results, the charges against Mr. Sutton went forward based on the same set of DNA results.[279] The Assistant District Attorney, Joseph Owemby, decided to continue with the prosecution of Mr. Sutton, even though the complaining witness already was shown to have mis-identified one of her attackers and the theory that Mr. Sutton and Mr. Adams participated in the attack together had fallen apart.

Mr. Sutton's trial lasted three days in July 1999. On July 7, 1999, Ms. Kim was called by the State to testify about her DNA results. In response to questions asked by Mr. Owemby, Ms. Kim told the jury, without elaboration or specificity, that the Crime Lab "matches" a "staff of standards [sic]" in connection with its DNA testing.[280] She also told the jury that "[t]here is an agency or association that we are trying to get [accredited] by" and that the Crime Lab was working on accreditation "right now."[281] Ms. Kim then explained that for this case she "examined the vaginal swab, cutting from

---

278 Following his conviction, Mr. Sutton moved for a new trial on the grounds that Mr. Herbert provided ineffective assistance of counsel by failing to obtain independent DNA testing. During the hearing on this motion, Mr. Herbert testified that, although he collected between $600 and $650 for the independent DNA testing, he told the family that they would need to raise a total of $1,200 to $1,500 for the testing. Mr. Herbert also claimed that he did not believe there were any unadulterated samples available for re-testing. Mr. Sutton's family members testified that Mr. Herbert took their money to have the test performed but never told them that they would need to pay more. Moreover, as reflected by the re-testing that eventually was performed in this case -- and which led to Mr. Sutton's exoneration -- there was, in fact, probative DNA evidence to be analyzed.

279 There is no indication in HPD's investigative record that HPD conducted any further investigation, once Mr. Adams was exonerated, to identify the unknown third donor whose profile Ms. Kim reported finding through her DNA testing.

280 *State v. Sutton*, Cause No. 800450, Tr. Vol. 4, at 173:7-10 (July 7, 1999).

281 *Id.* at 173:11-17. Of course, the Crime Lab's DNA Section would be shut down at the end of 2002 when an outside inspection found that it failed to meet the FBI's DAB guidelines for forensic DNA laboratories. The Crime Lab's DNA operation was first accredited by ASCLD/LAB in June 2006, almost seven years after Ms. Kim's testimony in the Sutton case.

the jeans, debris from the pubic hair combings, . . . number one unknown sample, and also three known blood samples from three different individuals. Josiah Sutton is one. Gregory Adams and [the victim]."[282]

Ms. Kim presented the results of her DNA testing to the jury as follows. She told them that "Josiah Sutton's DNA pattern was -- was detected from the DNA patterns that were detected from the vaginal swab of the male -- male pattern."[283] When Mr. Owemby asked about the "pubic hair debris," Ms. Kim testified, "[a]gain, Josiah Sutton's pattern was detected." When asked about the "cutting from the jeans," Ms. Kim replied, "[a]gain, Josiah Sutton's pattern was detected."[284] Ms. Kim never was asked to explain -- nor did she on her own -- the significance of her repeated statement that she detected "Josiah Sutton's pattern" in the evidence she tested. In light of the fact that the properly calculated random match probability for Ms. Kim's PCR results in this case was only approximately 1 in 14 in the African American population, the association between Mr. Sutton and the evidence in this case -- even accepting Ms. Kim's DNA typing results -- was weak. Nevertheless, the jury was given the highly prejudicial and misleading impression that Mr. Sutton's individual and unique DNA pattern was found in multiple evidence samples taken from the victim's sexual assault kit and clothing.

Mr. Herbert's cross-examination of Ms. Kim was brief and completely ineffective. Mr. Herbert raised only, in general terms, suggestions about the possibility of laboratory error and potential complications caused by the number of people involved in the chain of custody of the evidence. He made no attempt to challenge the technical work Ms. Kim performed in this case, her interpretation of the PCR results, or whether Ms. Kim's stated conclusions in her report and testimony actually were supported by the DNA typing results she obtained. Mr. Herbert did not hire a DNA expert who could have assisted with challenging Ms. Kim's DNA analysis in this case, and, as previously noted, he failed to have GeneScreen re-test the evidence.

---

282 *Id.* at 174:15-20.

283 *Id.* at 200:5-8.

284 Ms. Kim did not testify about the typing results she obtained from the "#1 sample." Earlier during her testimony, Mr. Owemby told her that "I don't want to talk about the unknown sample," referring to the "#1 sample." As discussed below, Dr. Thompson, who reviewed Ms. Kim's DNA work and trial testimony in this case, has opined that the "#1 sample" was potentially exculpatory of Mr. Sutton and that, for this reason, Mr. Owemby may have intentionally steered Ms. Kim away from discussing it.

The day after Ms. Kim testified, on July 8, 1999, Mr. Sutton was convicted of aggravated sexual assault and sentenced to 25 years in prison. He was 17 years old.

D. The Long Road to Mr. Sutton's Exoneration

Mr. Sutton was released from incarceration on March 12, 2003, after serving four and a half years of his 25-year prison sentence. As discussed below, he owes his freedom to the persistence of his mother and to the DNA re-testing that ultimately excluded him as a potential contributor to any of the biological evidence taken from the victim's rape kit, clothing, and vehicle.

1. Failed Appeal

Following his conviction, Mr. Sutton filed a motion for a new trial with the trial court asserting that Mr. Herbert provided ineffective assistance of counsel by failing to follow through on the independent DNA analysis to be performed by GeneScreen, which he had suggested be performed. During a hearing on the motion for a new trial, Mr. Herbert testified that, even though Mr. Sutton's family had given him between $600 and $650 for the re-testing and the evidence had been sent by HPD to GeneScreen in May 1999 (nearly two months before the trial), he did not obtain the DNA test results from the independent laboratory because (1) additional money was needed for the testing, which the family did not provide him, and (2) he did not believe there were any unadulterated samples remaining for testing. Even though two of Mr. Sutton's family members testified that Mr. Herbert never told the family that additional money for DNA testing was necessary and there in fact were samples forwarded by the Crime Lab that could have been tested, the trial court denied Mr. Sutton's motion for a new trial.[285]

Mr. Sutton then appealed his conviction on the grounds that Mr. Herbert provided ineffective assistance of counsel for failing to secure the independent DNA tests. The Court of Appeals referred back to the trial court's rejection of Mr. Sutton's ineffective assistance of counsel claim made in connection with a motion for a new trial as an implicit finding that the trial court accepted Mr. Herbert's justifications for failing to follow up on the independent DNA tests and that, therefore, his representation of Mr. Sutton was not deficient.[286] The Court of Appeals also found that there was no evidence that an "independent DNA analysis . . . would vindicate [Mr. Sutton] or raise questions about his innocence" and that "the State[']s DNA evidence which implicated

---

285 *Sutton v. State*, No. 14-99-00951-CR (Tx. 14th Ct. App. Jan. 18, 2001) (unpub. op.).

286 The Court of Appeals did suggest, however, that Mr. Sutton's family might consider lodging a bar grievance against Mr. Herbert regarding his handling of the funds provided for the re-testing.

[Mr. Sutton] and led to the dismissal of charges against others accused, is not seriously challenged."[287] On January 18, 2001, the Court of Appeals affirmed Mr. Sutton's conviction.

2. DNA Re-Tests and Mr. Sutton's Exoneration

After viewing the November 2002 KHOU news reports that questioned DNA and serology work performed by the Crime Lab and led to the closure of the DNA/Serology Section the following month, Mr. Sutton's mother contacted KHOU and asked the reporters to look into her son's case. The reporters, Anna Werner and David Raziq, contacted Professor Thompson to request that he review Ms. Kim's DNA analysis in the Sutton case. Professor Thompson reviewed the transcripts from Mr. Sutton's trials, his motion for a new trial and appellate brief, and the Crime Lab file related to Ms. Kim's DNA work in the case. During a report that aired on KHOU in January 2003, Professor Thompson described the Sutton case as a clear miscarriage of justice.

In response to KHOU's report and in light of the numerous media reports about profound problems in the Crime Lab's DNA operation, including its recent closure, HPD requested that an outside laboratory review the Crime Lab's case file for the Sutton matter. On January 31, 2003, the outside laboratory, Identigene, Inc. issued a report, finding that Ms. Kim's reported "results are incorrect and that the statistics were calculated incorrectly." Specifically, Identigene found that (1) the DNA analysis results for the jeans sample were inconclusive and should not have been reported as consistent with the reference samples; (2) Mr. Sutton's and Mr. Adams's profiles are excluded as possible contributors to the "#1 sample," and Ms. Kim's report was incorrect with respect to that sample; and (3) Ms. Kim's reported profile frequency is "incorrect" and "significantly overstates the possible association of the DNA profile of Josiah Sutton with mixture profiles found in the vaginal swab and the pubic hair combing's debris." The Identigene report concluded that "[w]e strongly recommend that this case be re-analyzed using more powerful STR DNA analysis methods." On February 3, 2003, Mr. Krueger, the Crime Lab director, forwarded the Identigene report up the chain of command with a cover memorandum stating that "[s]amples from the case will be sent out for reanalysis using the new STR procedures."

HPD forwarded reference samples for Mr. Sutton, Mr. Adams, and the victim, as well as the sexual assault kit vaginal smear, to Identigene for re-testing. On March 10, 2003, Identigene issued a report concluding that the "DNA profile[ ] of the reference

---

287 *Sutton*, No. 14-99-00951-CR (Tx. 14th Ct. App. Jan. 18, 2001) (unpub. op.), at 4

sample from Josiah Sutton . . . can be excluded" from being a contributor to the mixture of DNA profiles found in the sperm and epithelial fractions vaginal smear. Mr. Sutton was released from the Harris County jail two days later.

Even though Mr. Sutton had been released, the re-testing of DNA evidence in this case continued. HPD asked a second outside laboratory, Orchid Cellmark, to analyze the stain on the victim's jeans and the "#1 sample" taken from the middle seat of the victim's truck. On June 30, 2003, Orchid Cellmark issued a report stating that "Josiah Sutton . . . can be excluded as a donor" of the jeans sample and "#1 sample." Mr. Sutton was now cleared of being a contributor to DNA samples obtained from the victim's sexual assault kit (specifically, the vaginal smears), clothing, and vehicle.

Although the re-testing of DNA evidence in his case was complete and clearly established his actual innocence of the sexual assault on the victim, Mr. Sutton's legal exoneration would take more time. Texas Governor Rick Perry pardoned Mr. Sutton, based on innocence, on May 14, 2004. A year later, on May 25, 2005, the Texas Court of Criminal Appeals hearing Mr. Sutton's application for a writ of habeas corpus formally vacated the judgment of conviction entered after Mr. Sutton's trial. The Court of Appeals stated that: "The DNA used to convict [Mr. Sutton], originally tested by the Houston Crime Lab, was retested by an independent laboratory at the request of the State. The results exclude [Mr. Sutton] as a possible assailant."[288] In August 2005, Harris County District Attorney Charles A. Rosenthal, Jr. issued a letter stating that he did not oppose the payment of reparations to Mr. Sutton based on his wrongful conviction and incarceration. The following month, the State agreed to pay Mr. Sutton more than $118,000 to compensate him for the years he spent wrongfully imprisoned.

E. DNA Evidence Leads to the Conviction of the Actual Perpetrator

In addition to providing powerful evidence about the potential guilt or innocence of known suspects, DNA profiling technology is a powerful law enforcement tool to assist in the identification of suspects in "cold cases" where there is no known suspect, particularly in sexual assaults. DNA profiles obtained from evidence can be compared to the hundreds of thousands of known profiles stored in the CODIS database in order to develop investigative leads and identify potential suspects. In this case, use of the CODIS database led to the arrest of Donnie Lamon Young in 2006 for the sexual assault of the victim nearly eight years earlier.

After it was clear that Mr. Sutton was excluded as the donor of the male DNA profiles found in the stains associated with the rape, HPD worked with the Texas DPS

---

288 *Ex Parte Josiah Sutton*, No. AP-75,181 (Tx. Ct. Cr. App. May 25, 2005) (unpub. op.).

CODIS administrator, Dennis Loockerman, to have the unknown profiles that were developed by Identigene searched against the CODIS database. In July 2003, the two unknown male profiles detected by Identigene were compared against the CODIS database with no results.

In addition to having the Identigene profiles entered into CODIS, HPD also submitted a male profile that Orchid Cellmark had developed from the semen stain on the victim's jeans to the Harris County ME's Office for entry into the database. In May 2006, DPS notified HPD that it had obtained a CODIS "hit" matching the profile from the jeans sample to the DNA profile of a convicted offender. On May 9, 2006, the Crime Lab's current director, Ms. Rios, emailed an HPD sex crimes investigator to report that "[t]he DPS reported a DNA match from the victim's jeans to a convicted offender, Donnie Young. Once a sample is obtained from Young a direct comparison to the DNA profile on the jeans can be made."

On May 12, 2006, HPD obtained a buccal swab reference sample from Mr. Young, which was tested by Orchid Cellmark and compared to the DNA evidence related to the sexual assault of the victim. On June 9, 2006, Ms. Rios contacted the sex crimes investigator to inform him that Orchid Cellmark had confirmed that Mr. Young's DNA profile matched DNA evidence from the victim's sexual assault kit. Two days later, HPD officers arrested Mr. Young, and he was charged with aggravated sexual assault.

In January 2007, Mr. Young pleaded guilty to aggravated sexual assault in connection with the 1998 attack on the victim. In connection with his plea, Mr. Young told prosecutors that Damon Batiste was with him during the crime. Prosecutors determined that Mr. Batiste had died in prison. Mr. Young was sentenced to 10 years in prison.

F. Conclusions

The Sutton case in many respects is a microcosm of the range of problems we observed during this investigation related to the use of forensic DNA evidence in the Harris County criminal justice system. The system failed at multiple points, with the result that Mr. Sutton was wrongfully convicted and spent more than 4 years in prison based largely on flawed and misleading DNA work by the Crime Lab. The problems illustrated by the Sutton case include:

- **Serious problems with the Crime Lab's DNA analysis**. As we observed across a number of cases, Crime Lab DNA analysts, including Ms. Kim and others, demonstrated very poor technique in performing PCR-based testing during the 1990s. As a result of their poor technique and lack of training, HPD analysts

using PCR testing often produced ambiguous results reflecting complex mixtures, the interpretation of which was very difficult. The problem was exacerbated by the lack of any meaningful or competent technical review of the analysts' work -- the Crime Lab's equally poorly trained staff simply performed administrative reviews of each other's work and their supervisor, Mr. Bolding, was not competent to perform or to review PCR testing and denied being responsible for technical reviews. The Sutton case also illustrates the Crime Lab's practice of failing to accurately convey the significance of the associations they found between suspects and evidence through DNA testing, particularly in mixture cases.

- **Prosecutors' reliance on flawed forensic science work**. In the Sutton case, Harris County prosecutors relied on the Crime Lab's flawed forensic DNA work with disastrous results. Our review of this case is not meant as a criticism of the victim. She endured a horrifying attack that doubtless left her deeply traumatized. Indeed, as discussed above, a 1995 FBI study found that, between 1989 and 1995, suspects positively identified by sexual assault victims were excluded by DNA testing in nearly a quarter of cases.[289] Here, the prosecutor went forward with the charges against Mr. Sutton even though the victim's positive identification of the co-defendant in this case was contradicted by the Crime Lab's original DNA results and the charges against him were dismissed. The prosecutor appears to have pressed forward in the case against Mr. Sutton in large part because the Crime Lab advised him that Mr. Sutton's DNA profile was found in the evidence. The prosecutor, however, did not appear to have a sufficient understanding of DNA evidence to recognize the weakness of Ms. Kim's inclusion of Mr. Sutton.

- **Poor representation by defense counsel**. Mr. Herbert was not prepared to defend a case based largely on DNA evidence. He failed to follow through on the DNA re-testing that he suggested be performed. He failed to retain an expert to educate him about DNA analysis and to assist him in identifying weaknesses in the Crime Lab's analysis, of which there were many in the Sutton case. Mr. Herbert failed to mount any semblance of an effective cross-examination of Ms. Kim, failing to challenge her results in this case or to probe the statistical significance of her inclusion of Mr. Sutton.

---

289 *See Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence to Establish Innocence After Trial*, United States Department of Justice, Office of Justice Programs, National Institute of Justice (June 1996), at 20.

- **CODIS**. One of the tragedies of the historical Crime Lab, which came to light in the early 2000s, was its failure to process sexual assault kits in cases in which there was no known suspect so that DNA profiles developed from evidence in those kits could be entered into the CODIS database. As illustrated by HPD's apprehension of Mr. Young -- nearly eight years after he raped the victim -- CODIS can be an extremely powerful law enforcement tool. However, it is only as useful as the data that is entered into it.

IV. Nanon Williams

In the early morning hours of May 14, 1992, four young men gathered in a Houston park for a drug deal. Moments later, 19-year-old Adonius Collier was shot twice in the head, once with a small caliber pistol and once with a shotgun. Nanon Williams, a juvenile at the time of Mr. Collier's death, was later charged with Mr. Collier's killing and convicted of capital murder. Mr. Williams remains in prison today, although his death sentence was recently commuted to a life sentence.

The Williams case was selected for more detailed review by our investigative team because three HPD firearms examiners misidentified potentially significant fired bullet evidence. One of the HPD examiners provided incorrect testimony at trial based on the misidentification. Critics have also asserted that HPD investigators contributed to the misidentification because they failed to submit a weapon associated with the crime to the Firearms Section for examination and test-firing before Mr. Williams's trial.

To assess the conduct of the Crime Lab in connection with the Williams case we reviewed information gathered during the HPD investigation, evidence presented at the trial, and evidence developed during post-conviction proceedings. Our forensic experts conducted an independent examination of the fired bullet evidence that was examined by the Crime Lab for the Williams case. We also evaluated the significance of the Crime Lab's conclusions and testimony relating to the misidentified evidence.

A. Background

Several days before the Collier murder, according to evidence presented at trial, Mr. Williams approached his neighbor, Elaine Winn, and asked about buying crack cocaine from Mr. Collier. Ms. Winn was 20 years old at the time and had an "off and on" dating relationship with Mr. Collier. She told HPD investigators that she helped arrange several meetings between Mr. Collier and Mr. Williams over the next several days. Just before midnight on May 13, 1992, Ms. Winn, Mr. Williams, Vaal Guevara, and a fourth individual (who was positively identified as Patrick Smith in 1998) drove to Mr. Collier's apartment to purchase cocaine. Arrangements were made to meet elsewhere, and the parties drove in separate vehicles to Hermann Park. Mr. Collier was

accompanied by Emmade Rasul and Stephanie Anderson, Mr. Rasul's 14-year-old girlfriend.

According to several witnesses, the group met in a well-lit parking lot at Hermann Park. Mr. Collier, Mr. Rasul, Mr. Williams, and Mr. Guevara left the vehicles and walked to a dark, heavily wooded area nearby. Ms. Anderson remained in Mr. Rasul's car, and Ms. Winn testified that she waited in the other vehicle with the man later identified as Patrick Smith. Soon after the men entered the woods, between 3 and 5 gunshots were heard. Mr. Rasul ran from the woods, and he and Ms. Anderson then fled on foot. Mr. Guevara and Mr. Williams reportedly re-joined Ms. Winn and Mr. Smith in the parking lot and drove away from the scene.

Mr. Rasul was able to get to the nearby Ben Taub Hospital, where he was treated for gunshot wounds to the face and right foot. He was released later the same day. Anderson flagged down an HPD officer near the hospital at around 1:15 a.m. and took the officer to the crime scene. Mr. Collier was dead when the officer arrived.

Mr. Rasul was interviewed by HPD investigators 15 days after the shooting. Mr. Rasul told HPD investigators that he and Mr. Collier were not armed during the meeting with the suspects, whom he met for the first time on the night of the murder. He reported that one of the suspects suddenly pulled a pistol from the front of his pants and shot Mr. Rasul in the face. Mr. Rasul ran from his attacker and was shot in the right foot as he fled. Mr. Rasul said that the suspect who shot him in the face was taller, heavier, and more muscular than the second suspect. Mr. Rasul subsequently identified Mr. Guevara in an HPD line-up as one of the two suspects involved in the crime but said Mr. Guevara was <u>not</u> the suspect who had shot him in the face. Mr. Guevara was approximately 5 inches shorter and 25 pounds lighter than Mr. Williams, according to HPD records.

On May 30, 1992, HPD investigators visited an apartment believed to be occupied by both suspects and reported that they were invited in by an occupant. An HPD reports states that, while the officers were in the apartment, they noted in plain view some .25 caliber bullets, a .22 caliber derringer long rifle, and a spent shotgun shell. An HPD police officer "later took custody of these items and tagged them in the firearms lock box."[290] Probable cause arrest warrants were issued for Mr. Williams and Mr. Guevara on the morning of May 30, 1992.

---

290 As discussed in greater detail below, a 2003 investigation by IAD concluded that the statement regarding placement of the firearms evidence in the firearms lock box was incorrect and that the derringer was actually submitted to the Property Room. The IAD investigation also concluded

Footnote continued

Mr. Williams was arrested in California on August 23, 1992 and extradited to Texas. Mr. Guevara and Mr. Williams were each charged with capital murder in connection with the shooting death of Mr. Collier.

B. Evidence Implicating Nanon Williams in the Death of Adonius Collier

One of the central disputed issues in the Williams case has been the identity of the shooter who delivered the fatal gunshot wound to Mr. Collier. During the trial, the State's theory was that Mr. Williams murdered Mr. Collier by firing two shots at Mr. Collier's head, the first with a .25 caliber weapon and the second with a 12 gauge shotgun. According to the State, Mr. Guevara shot Mr. Rasul with the .22 caliber derringer.

The defense argued that it was Mr. Guevara -- not Mr. Williams -- who shot Mr. Collier first. According to the defense, the shot fired by Mr. Guevara killed Mr. Collier, and the subsequent shotgun blast therefore did not cause Mr. Collier's death.[291] Mr. Guevara agreed to cooperate with prosecutors and testify against Mr. Williams. He pleaded guilty to the offense of attempting to make an "illegal investment" and was sentenced to 10 years in prison after testifying at Mr. Williams's trial.

1. Witness Testimony Regarding Firearms Used at the Crime Scene

Mr. Guevara testified that he carried a .22 caliber derringer with him to the meeting with Messrs. Collier and Rasul. He testified that he pointed and fired the derringer in Mr. Rasul's direction, but only after two shots were fired by somebody else in the group. Mr. Guevara later admitted on cross-examination that he previously told police in a taped interview that he actually fired the .22 caliber derringer at Mr. Collier, not Mr. Rasul, and that Mr. Collier had not yet been shot when Mr. Guevara did so.

None of the individuals who were waiting in the parking lot witnessed the shooting. However, Ms. Winn told police that Mr. Williams was carrying a concealed shotgun when he left the car and returned with the shotgun after the shootings. Ms. Winn also told HPD investigators that, after Mr. Rasul ran through the parking lot, she heard a gunshot that was louder than the previously fired shots.

Footnote continued from previous page

that the failure to submit the derringer to the Firearms Section for test-firing was attributable in part to this mistake.

291 Mr. Williams has denied responsibility for Mr. Collier's death and did not admit to firing the shotgun at Mr. Collier.

2. The Crime Lab's Pre-Trial Analysis of Firearms Evidence

A fragment of an extensively deformed and fragmented small caliber bullet (identified as EB-1) was collected from Mr. Collier's head at autopsy, along with 68 lead shotgun pellets. HPD officers also recovered an unfired .25 caliber cartridge at the scene. The bullet fragment, lead pellets, and a fired plastic shot carrier recovered at the crime scene were submitted to the Crime Lab on May 19, 1992. An HPD firearms examiner, Robert Baldwin, received the evidence on May 19 and logged it in on May 20, 1992.

Donald Davis, an HPD Crime Lab firearms examiner, issued a report dated June 16, 1992 in which he concluded, based solely on a visual examination, that EB-1 was a .25 caliber bullet. Mr. Davis also reported that the plastic shot carrier was consistent with a 12 gauge shotgun but contained insufficient definite characteristics for identifying the firearm. The 68 fired shotgun pellets were found to be #6 birdshot.[292]

On March 25, 1994, a bullet that was removed from Mr. Rasul's foot when he was treated at Ben Taub Hospital was retrieved from the hospital by an HPD investigator. This bullet is identified as EB-2.[293]

HPD firearms examiner C. E. Anderson examined items labeled EB-1 and EB-2 on June 23, 1995. He reported that the two fired, jacketed lead bullets were partially mutilated but that land and groove measurements on both bullets indicated "that they could have been fired in a firearm of the same manufacture." The caliber of EB-1 and EB-2 is not explicitly identified, but the report implies that Mr. Anderson concluded the bullets were .25 caliber because it states that "we are in concurrence with [Mr. Davis's] findings," which concluded that EB-1 was a .25 caliber bullet. Mr. Anderson and Mr. Baldwin are identified as the firearms examiners responsible for this report.

---

292 A few days later, an HPD officer tagged Mr. Guevara's derringer into the Property Room, where it remained until shortly before Mr. Williams's trial began. The .22 caliber derringer was submitted to HPD's Latent Prints lab, which reported on June 20, 1995 that there were no suitable latent prints on the weapon. The derringer was returned to the Property Room the same day and was not submitted to the Firearms Section for examination until 1998, nearly three years after Mr. Williams's trial.

293 The bullet that struck Mr. Rasul in the face entered his left cheek and exited near the back of his head; it was never recovered by HPD.

3. Trial Testimony Regarding the Crime Lab's Evaluation of Firearms Evidence

During the prosecution's direct examination, Mr. Baldwin was asked specific questions regarding the dates on which he examined State's Exhibit No. 21, which included EB-1.

Q Sir, what day did you actually examine State's Exhibit No. 21?

A Well, actually there were two occasions that I had -- there were two different occasions I had to examine this evidence. At the time that Officer Horowitz initially submitted this evidence to the Firearms Laboratory I was responsible at that time for logging in evidence that had been submitted to the laboratory. That was the first occasion that I had to examine any of these items. And that was on May the 20th of 1992, I believe.

Q Did you also examine it on a second date?

A At a later time, based on a request from your office, there was a re-examination of the evidence made by Mr. Anderson, Mr. C.E. Anderson, who is a senior firearms examiner, and myself; yes.

Q On what date?

A That was on June 23rd of 1995.[294]

Responding to an IAD investigation that occurred eight years after Mr. Williams's trial, Mr. Baldwin acknowledged that the examination he performed when logging in evidence on May 19, 1992 was cursory. Mr. Baldwin reported that his June 23, 1995 examination was more detailed and included a microscopic comparison of EB-1 and EB-2 to verify Mr. Anderson's identifications. During that comparison, Mr. Baldwin examined the individual characteristics of each bullet and evaluated the widths of each bullet's lands and grooves.[295]

---

294 *Williams v. Texas*, Cause No. 63442, Tr. at 17:20-25, 18:1-20 (July 18, 1995).

295 Mr. Baldwin did not conduct a GRC analysis at that time, as that examination was performed by the "primary examiners," Mr. Davis and Mr. Anderson. During cross-examination, Mr. Baldwin acknowledged that his testimony regarding possible manufacturers of EB-1 came from Mr. Davis's report.

Based on the examination that he actually did conduct, Mr. Baldwin concluded that there were insufficient individual characteristics to relate EB-1 and EB-2 to each other, meaning that he was unable to conclude that the bullets were fired from the same weapon. Because both bullets exhibited rifling with a left twist and land and groove impressions of a similar width without any misalignment, Mr. Baldwin found no reason to disagree with the conclusions of Mr. Anderson (who was then head of the Firearms Section and an examiner with 20 years' experience) and Mr. Davis (also an experienced examiner). IAD nevertheless concluded that Mr. Baldwin violated HPD Internal Directives by testifying at Mr. Williams's trial without conducting his own independent examination of the evidence.

As noted above, Mr. Guevara admitted on cross-examination that he told HPD investigators that he fired the .22 caliber derringer in the direction of Mr. Collier during the aborted drug deal. The State moved the derringer into evidence and elicited the following testimony from Mr. Baldwin to support its theory that it was not Mr. Guevara's gun that produced the bullet in Mr. Collier's head:

> Q Is there any way in the world, based on your training, your expertise and the examinations that you made, that the bullet [EB-1], which was part of the submission in State's Exhibit No. 21, was shot out of that Derringer, State's Exhibit No. 17?
>
> A No, sir. It's the wrong caliber, plus the type of cartridge used in State's 17 is a rim fire cartridge and the .22 automatics are center fire cartridges. [296]

Mr. Baldwin then testified that EB-1 and EB-2 were both .25 caliber bullets and that neither could have been fired from the derringer:

> Q Before I go any further, show these to the jury, what type of bullet is the bullet that was submitted in State's Exhibit No. 22 [EB-2]?
>
> A That's a .25 automatic full metal jacketed bullet.
>
> Q How can you [be] so certain that both of these are .25 caliber bullets?
>
> A Comparison. We compared both bullets to each other. The base diameters were consistent. We also compared the land and groove

---

296 *Williams*, Tr. at 24:5-15 (July 18, 1995) .

widths and the number of lands and grooves, and they were also consistent with each other.

Q Now, these bullets don't look at all like each other. What makes you say they are the same type of bullet?

A The reason they don't look the same is the fact that the one bullet which was recovered from the morgue is extremely mutilated. A very large portion of its mass is missing.

Q In fact, sir, in addition to being the same diameter, are they the same make of ammunition?

A Yes, sir.

Q Is there any way the bullet in State's Exhibit No. 22 could have been fired out of that Derringer, which is State's Exhibit No. 17, any way in this world?

A No, sir. As indicated, State's Exhibit No. 22 is a .25 automatic, and the cartridge for a .25 automatic is larger in diameter than this weapon would be chambered to handled. Also, the .22 is a rim fire cartridge and the -- excuse me -- the .25 automatic is a center fired cartridge.[297]

When the prosecutor asked Mr. Baldwin to examine examples of .22 caliber cartridges, Mr. Baldwin confirmed that he had not previously examined the derringer:

Q Could a cartridge like that have been fired from that Derringer we have been speaking about or could it be used in that Derringer . . . ?

A Yes, it could, but I don't know what the functional condition of that Derringer is. I have never checked it.[298]

Neither Mr. Baldwin nor the investigators handling Mr. Williams's case made arrangements to have the derringer examined by the Firearms Section after the trial.

---

297 *Id*. at 25:7-26:19.

298 *Id*. at 33:15-22.

C. Post-Conviction Proceedings

1. The Misidentification of EB-1 is Discovered and Reported

Lawyers handling Mr. Williams's appeal sought and eventually obtained an order that the firearms evidence be turned over to a defense expert. The Harris County District Attorney's office asked Mr. Baldwin to test-fire the derringer before it was provided to the defense "in order to preserve the integrity of the evidence."

On January 15, 1998, the Crime Lab test-fired the derringer for the first time. Based on a microscopic comparison of EB-1 to the bullet obtained from the test-firing, Mr. Baldwin concluded that EB-1 was actually a .22 Magnum caliber bullet that had been fired from the bottom barrel of the double-barreled derringer carried by Mr. Guevara.

Mr. Baldwin's results were verified by Michael Lyons, another HPD firearms examiner. Mr. Baldwin promptly issued a report with the new conclusions, and Mr. Williams's lawyers were notified of the results. The revised findings undermined a central aspect of the prosecution's case, which was based on the premise that Mr. Guevara's .22 caliber derringer could not have fired the bullet that was removed from Mr. Collier's head.

2. State Court Proceedings

Lawyers for Mr. Williams have asserted in subsequent appeals that Mr. Baldwin's revised conclusions demonstrate that the State's evidence was false and prove that Mr. Guevara fired the fatal gunshot. The revised conclusions regarding EB-1 led to two evidentiary hearings in state district court. Several jurors from the 1995 trial provided affidavits stating that evidence that EB-1 had come from the derringer "would have changed the trial." Mr. Williams's independent forensic pathologist provided an affidavit in which he opined "that the shotgun wound is obviously a lethal wound, but it is not clearly or convincingly the only cause of death of Adonius Collier."

Ronald Singer, of the Tarrant County ME's Office, reviewed the firearms evidence for the defense. In an affidavit dated April 15, 1998, he stated that:

> Even in their "damaged" state, the .22 Magnum caliber bullet, State's Exhibit EB-1 and the .25 Auto caliber bullet, State's Exhibit EB-2 are easily distinguishable from one another, particularly if examined with the aid of a comparison microscope, and should have presented no problem to a competent firearms examiner. Mr. Baldwin's testimony at trial that EB-1 was a .25 caliber projectile that could have been fired from the same gun as the bullet EB-2, recovered from another victim's foot, at best

> demonstrates extreme carelessness on his part, and at worst calls in to question his expertise.[299] If the bullet had been correctly identified during one of the at least three times it was examined by the Houston Police Department, the bullet could have been compared to the Davis derringer prior to trial; this might have materially affected the outcome of the trial.

Mr. Singer was also quoted in the press, stating that "[t]here is enough of a difference between a .25 caliber bullet and a .22 Magnum that even a non-expert could look at them and tell the difference."

Lawyers for Mr. Williams filed a brief with the Texas Court of Criminal Appeals, asserting that Mr. Williams was convicted and sentenced to death because of Mr. Baldwin's incorrect testimony. They also argued that Mr. Williams did not have effective assistance of counsel because his trial counsel did not request independent testing of the firearms evidence. The defense team admitted that Mr. Collier was shot with both a shotgun and a handgun but argued that there were reasonable doubts as to whether EB-1 or the shotgun blast caused Mr. Collier's death. They suggested that another person who accompanied Mr. Williams to Hermann Park fired the shotgun. They also maintained that testimony and arguments during the trial were misleading, and likely affected the jury's verdict.

The district judge presiding over the habeas corpus hearing recommended that Mr. Williams's death sentence and conviction be reversed and a new trial granted. Lawyers for Mr. Williams asked the Court of Criminal Appeals to defer to the trial court's determination. On April 24, 2002, Mr. Williams's petition was denied; in its written opinion, the Court of Criminal Appeals stated that the new evidence provided at the evidentiary hearing did not support the trial court's key findings and recommendations in Mr. Williams's favor. Mr. Williams's request for a new trial was also denied.

---

299 In 2003, HPD's IAD investigated and sustained allegations relating to the misidentification of bullet evidence in the Williams case and concluded that there was no intentional misconduct or malfeasance in the misidentification of EB-1 as a .25 caliber bullet. IAD also investigated the failure to submit the derringer to the Firearms Section for test-firing before Mr. Williams's 1995 trial. Investigators found that an HPD lieutenant involved in the homicide investigation inadvertently indicated in a June 1, 1992 report that his partner tagged the weapon into the firearms lockbox, when, in fact, it was submitted to the Property Room. Investigators concluded that the error was inadvertent and that the decision not to submit the derringer immediately to the firearms lab for examination was understandable because officers investigating Mr. Williams's case were informed that the fired bullet available for comparison was a .25 caliber bullet.

3. Federal Court Proceedings

Mr. Williams's attorneys continue to pursue habeas corpus relief in the federal courts. In March 2005, the United States Supreme Court held that executing prisoners for a crime committed when they were under the age of 18 violates the Eighth Amendment's prohibition against cruel and unusual punishment.[300] As a result, the U.S. District Court for the Southern District of Texas issued an order directing that Williams be released from prison unless the State of Texas commuted his sentence to life imprisonment within 180 days.[301] The State subsequently reduced Mr. Williams's sentence to life in prison.

In the same May 2005 ruling, the U.S. District Court rejected all of Mr. Williams's claims associated with the guilt and innocence phase of his trial -- including claims regarding the misidentification of EB-1. Mr. Williams's appeal is currently pending before the U.S. Court of Appeals for the Fifth Circuit.

D. The Investigative Team's Analysis of Work Performed by the HPD Crime Lab in the Williams Case

1. The Fired Bullet Evidence

We conducted an independent evaluation of the fired bullet evidence presented by the Crime Lab. One of the examinations performed in connection with our review was a comparison of class characteristics, including the base diameter of the bullets.

Bullet base diameters vary slightly by manufacturer. For example, EB-1 was ultimately determined to be a .22 Magnum rimfire caliber copper jacketed lead bullet. When it is intact and undamaged, this bullet has a base diameter of approximately 0.225 inches. EB-2 was determined to be a .25 caliber copper jacketed lead bullet, and, when this bullet is undamaged and intact, it has a base diameter of approximately 0.250 inches. The difference in diameter for intact, undamaged .22 Magnum rimfire caliber bullets and .25 auto caliber bullets is therefore approximately 0.025 inch. Though this difference in base diameters is small, it is visually discernible, as illustrated in the following image:

---

300 *Roper v. Simmons*, 543 U.S. 541 (2005).

301 *Williams v. Dretke*, No. 4:03-cv-01508 (S.D. Tex. May 5, 2005).

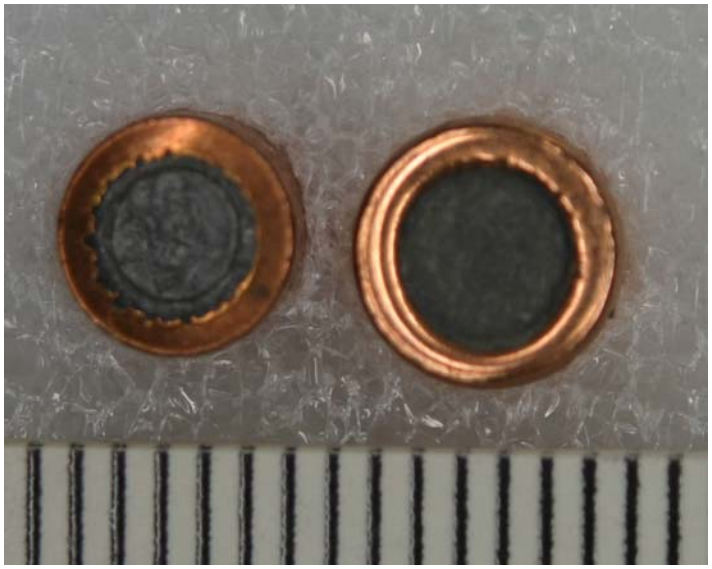


IMAGE 1: Base of unfired .22 Magnum caliber (left) compared to base of .25 auto caliber bullet (right) [scale is mm]

The side-by-side comparison contained in Image 2 also shows visually discernible differences in the size of the two types of bullets.

IMAGE 2: Unfired .22 Magnum rimfire caliber bullet (top) compared to a .25 auto caliber bullet (bottom)

As Images 1 and 2 indicate, Mr. Singer's assertion that a non-expert can perceive the difference between a .25 caliber bullet and a .22 Magnum caliber bullet is true if the bullets being compared are in good condition. However, when a bullet hits a hard surface, distortion and/or fragmentation typically occur. Distortion can alter the apparent base diameter of a bullet. It can also cause apparent rifling orientations to be different than actual (right twist can appear as left twist and vice versa). Identification of EB-1 was not simple because only a bullet fragment was retrieved, and that fragment was extensively deformed, as Images 3 and 4 demonstrate.

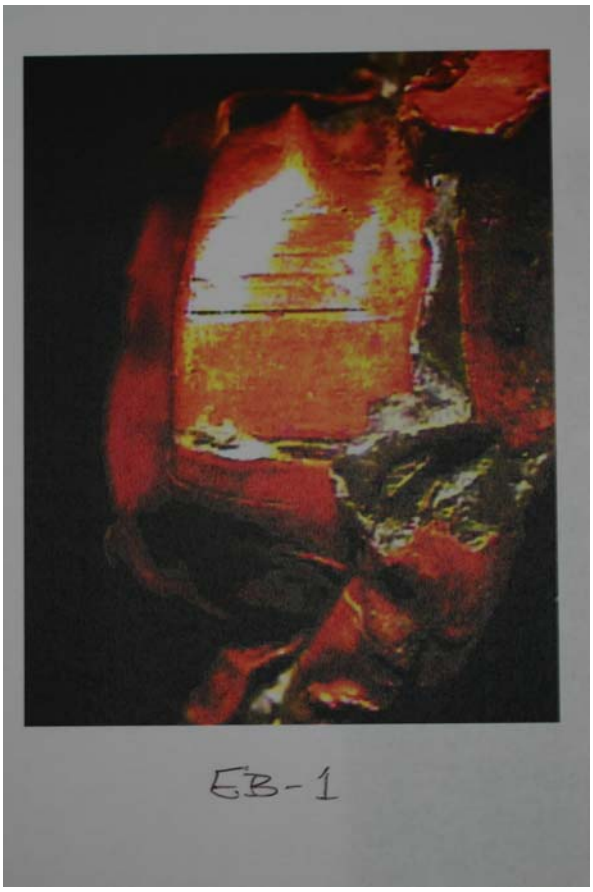


IMAGE 3: Remaining base fragment (side view) identified as EB-1

Caliber determinations are based on the assumption that bullets fired from the same weapon show comparable base diameters. When a bullet has been fired, the diameter of the barrel bore is approximated by measuring the bullet's base diameter. In this case, the distortion of EB-1 caused its bullet base diameter to be variable, as is illustrated in Image 4, and some of its measurements were similar to those of a .25 caliber bullet. The parallel solid white lines contained in Image 4 indicate the apparent similarities in gross diameters of the two bullet bases. The dashed white lines

approximate the true diameter of EB-1, which has a base diameter between 0.2225 to 0.2545 inches; the base diameter of EB-2 is 0.2500 inches.

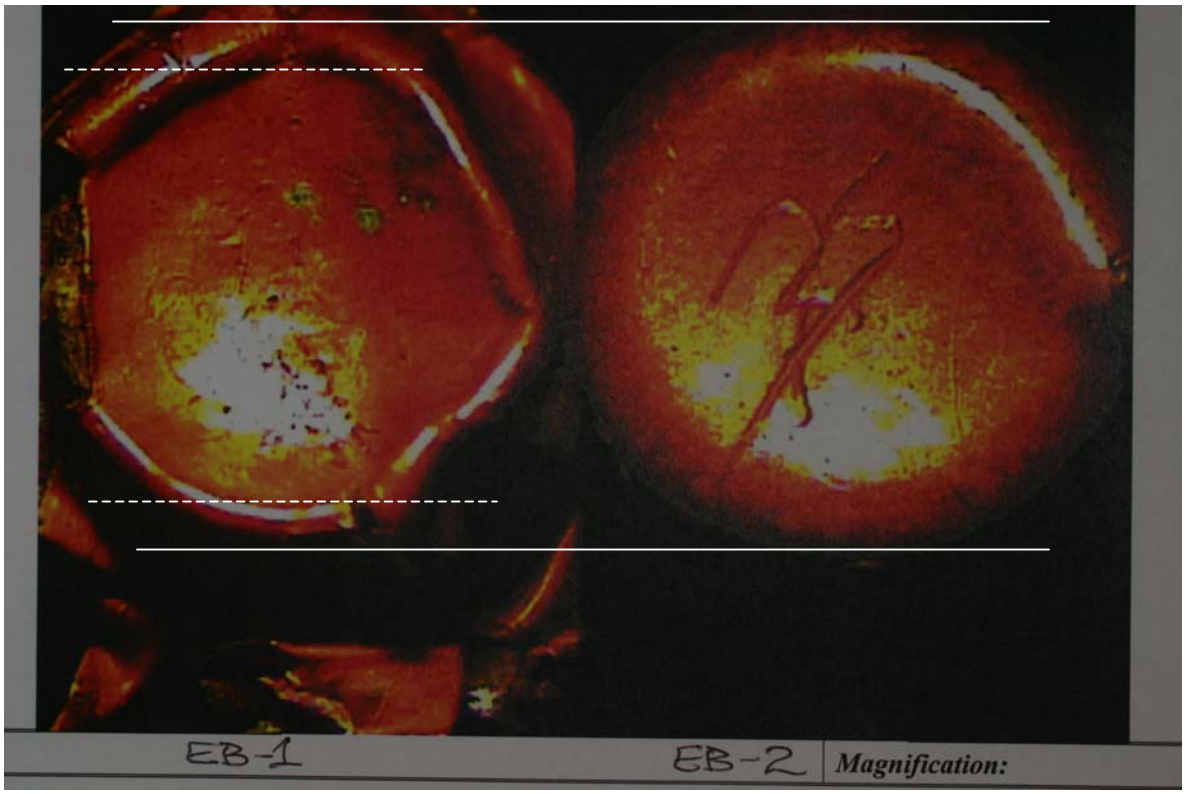


IMAGE 4: Comparison of base portions of EB-1 and EB-2

The distortion of EB-1 seems obvious in the side-by-side comparison of EB-1 and EB-2 that is provided in Image 4. However, this distortion -- and its effect on the determination of the bullet's caliber -- would not have been as obvious based on an examination of EB-1 alone. (Mr. Davis did not have EB-2 when he made his examination in June 1992; EB-2, which was removed from Mr. Rasul's foot, was not provided to the Crime Lab until more than a year later.) This is especially true because Mr. Davis did not perform a microscopic examination. A firearms examiner should consider the possibility that the distortion of a bullet would affect its base diameter.

Other factors may have contributed to the failure of the various HPD firearms examiners involved in this case to recognize the distinction between EB-1 and EB-2. As seen in Image 2, distinctions in the design and construction of an unfired .25 Magnum caliber bullet and an unfired .22 caliber bullet are obvious. When the side views of EB-1 and EB-2 are compared, however, these distinctions are not discernible because of the extensive damage to and fragmentation of EB-1. The only information regarding design

and construction that can be derived from EB-1 is that it appears to be a full metal jacket design with a slightly concave base.

To compare GRCs, a firearms examiner determines the number of lands and grooves on the bullets being compared and the direction of their twist. The width of the lands and the grooves can also be measured, and the sum of those measurements should permit a calculation of the diameter and indicate the caliber. However, this step is not possible for distorted bullets or fragments like EB-1. HPD examiners could only compare limited information from the fragment of EB-1 to measurements from EB-2.

EB-2 has six lands and grooves with a left twist, and, as evidenced in Image 5 below, EB-1 appears to have similar GRCs.

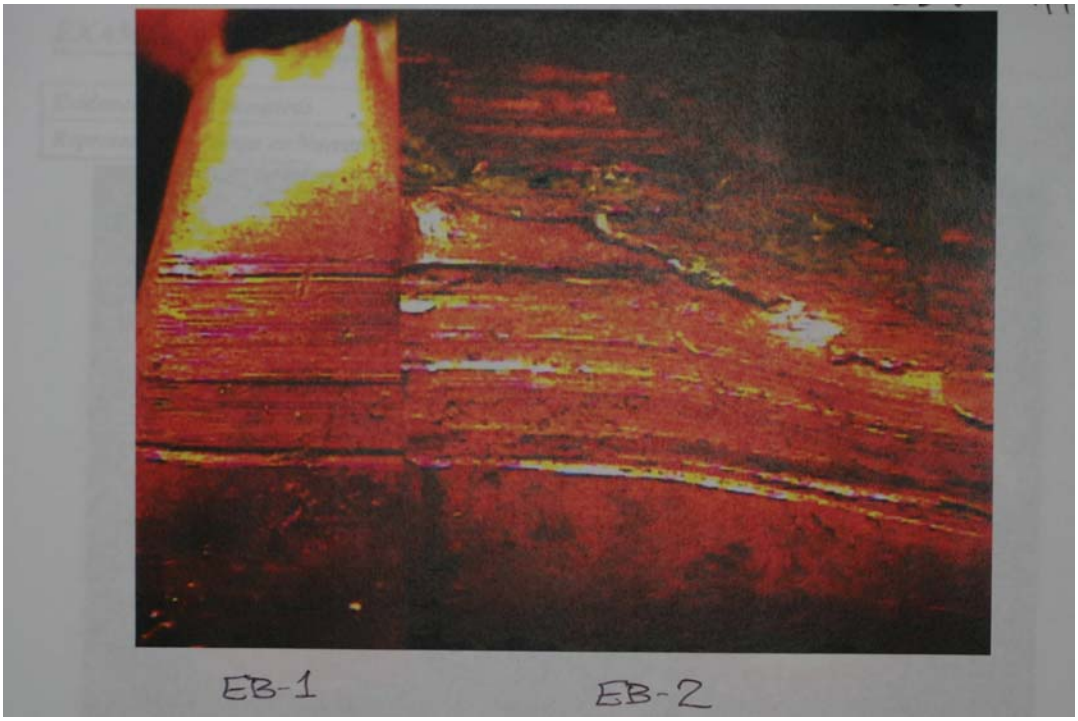


IMAGE 5: Bullet groove width comparison of EB-1 to EB-2

The similarities in the rifling dimensions as well as in the gross features of the rifling impressions themselves are readily apparent in Image 5, which further illustrates how an examiner could mistakenly conclude that EB-1 and EB-2 had similar class characteristics. The June 23, 1995 report issued by Mr. Anderson and co-signed by Mr. Baldwin states that the bullets "could have been fired in a firearm of the same manufacture." Such a conclusion is appropriate when class characteristics are similar.

We searched the FBI Crime Laboratory Information System for a list of .22 Magnum caliber weapons and .25 auto caliber weapons with six lands and grooves and with a left twist. Those with the closest similarities in dimensions were the .22 WMR Davis Industries DM-22, which has a land width of 0.54-0.56 inches and a groove width of 0.60–0.62 inches. The 25 auto Astra Cub has a land width of 0.58-0.64 inches and a groove width of 0.63–0.66 inches.

These dimensions are provided to demonstrate that similar dimensions can be found in bullets of two different calibers. We do not mean to suggest that EB-2 was necessarily fired from an Astra Cub (no .25 caliber weapon was recovered in the Williams case), but note that the weapon used to fire EB-1 was, consistent with the above dimensions, ultimately determined to be a Davis Industries DM-22 derringer.

2. Mr. Baldwin's Trial Testimony

The fact that Mr. Davis's error was repeated when Mr. Baldwin testified in 1995 from the record of another examiner's notes is unfortunate. This practice, though ill-advised, is not illegitimate and was common in some crime laboratories for many years. This was especially true in laboratories that, like the Crime Lab, lacked sufficient staff. However, we also believe that Mr. Baldwin's testimony regarding his role in the May 1992 examination of EB-1 might have given jurors the misleading impression that his review involved a more substantive examination than the cursory inspection he described during the 2003 IAD investigation.

E. Conclusions

We believe that EB-1 was misidentified as a .25 caliber bullet because distortions caused the bullet fragment to exhibit apparent similarities in class characteristics to those of a .25 caliber bullet. That error was exacerbated by the subsequent submission of EB-2, which, as we demonstrate above, had similar class characteristics. The failure of HPD investigators to submit the .22 Magnum derringer to the Firearms Section with a request to compare the bullet evidence to the firearm itself also contributed to the misidentification.[302] The misidentification was perpetuated because the Crime Lab lacked appropriate quality assurance protocols at the time and during the years that preceded ASCLD/LAB accreditation of the Lab. This case underlines the need to strictly adhere to the revised protocol that was adopted in the period leading up to the ASCLD/LAB accreditation.

---

302 We recognize, however, the unfortunate situation that existed where, based on the initial misidentification, the investigators were operating on the assumption that a .25 auto caliber weapon was involved in the homicide, not a .22 caliber firearm.

We disagree with Mr. Singer's assertion that the recognition of EB-1 as a .22 Magnum caliber bullet should have been possible "even for a non-expert." We note that, absent the submission of the .22 derringer or any other suggestion that a .22 caliber weapon may have been associated with EB-1 or EB-2, it would be possible to assume that EB-1, a distorted bullet fragment, was similar to EB-2, a .25 caliber bullet. This is especially true in this case because the recovery of a live round of .25 auto ammunition at the scene of Mr. Collier's murder reinforced that conclusion.

We believe that Mr. Davis reached the wrong conclusion partly because he had only EB-1 available at the time of his examination. Additionally, Mr. Davis conducted only a visual examination of EB-1; he did not perform a careful microscopic examination. It is not uncommon for firearms examiners to determine class characteristics with a cursory visual examination. However, deformation can change the apparent class characteristics of a bullet or fragment, and a firearms examiner should therefore conduct a careful microscopic examination.

We also agree with the results of Mr. Baldwin's 1998 examination. The fact that the Firearms Section did not reach these correct conclusions until several years after the discovery of the evidence was not, in our view, caused by technical incompetence on the part of Mr. Baldwin, who consistently demonstrated his competence in other cases we reviewed. Rather, inadequacies in the Firearms Section's policies were to blame for the fact that the original error went undetected for so long.

In sum, we believe that the original error committed by Mr. Davis in 1992, which was verified by Mr. Anderson in his 1995 report and further confirmed by Mr. Baldwin, was perpetuated by the lack of adequate quality assurance practices in the Firearms Section. HPD firearms examiners were apparently allowed to co-sign reports of other examiners without personally reviewing the evidence that was the subject of the report. That practice was contrary to generally accepted forensic science principles and obviated the purpose of secondary signatures on each report.

While the failure to correct Mr. Davis's error before trial was unfortunate, Mr. Baldwin's revised findings and many other defense arguments have been presented in great detail to three reviewing courts. Two of the three courts have concluded that errors committed by examiners in the Crime Lab do not justify reversal of Mr. Williams's conviction, and the Williams case remains subject to ongoing review in the federal courts. Additionally, Firearms Section polices and procedures have been revised by the Crime Lab since the events described in this review. We believe that -- if closely followed by HPD firearms examiners -- the updated policies and procedures minimize the risk of mistakes like those that occurred in Mr. Williams's case.

Review of the Crime Lab's Current Operations and Recommendations

From the outset, the City Council, Stakeholders Committee, and HPD have emphasized the importance of our formulating recommendations for the Crime Lab. These recommendations are designed to serve two complementary purposes: (1) to assist HPD in establishing the Crime Lab as one of the preeminent law enforcement forensic laboratories in the nation and (2) to provide a means for holding HPD and the Lab accountable for the quality of forensic science services provided to the people of Houston.[303] In order to adequately support relevant and useful recommendations, we performed a comprehensive review of all of the current functions of the Crime Lab.

Our review of the Crime Lab's current operations included a review of the following: SOPs for each of the forensic science disciplines now being applied in the Lab, Lab-wide manuals and protocols, training and proficiency testing materials for the Lab's current analytical staff, data regarding the Lab's budget and caseload, information about the existing salary structure for Lab personnel, and incident logs and records. We also interviewed members of the Crime Lab staff to get their views about the current organization, management, and needs of the Lab.

In consultation with PwC, we selected statistical samples of cases analyzed in each of the forensic science disciplines during the period following ASCLD/LAB accreditation in May 2005. For the types of analysis accredited by ASCLD/LAB -- controlled substances, firearms, blood alcohol testing, and questioned documents -- we selected samples of cases completed and reported by the Crime Lab between June 2005 and the end of October 2006.

The general sampling methodology we developed in consultation with PwC was to select samples of 30 cases in each of these areas. Similar to the methodology relating to our review of historical controlled substances cases, we selected two samples from the current drug cases. The first sample was a general sample drawn from the entire population of controlled substances cases processed by the Crime Lab during the relevant period. We also selected a separate sample that targeted cases involving

---

303 HPD now has received some form of accreditation for each of the forensic science disciplines currently practiced in the Crime Lab. All of our recommendations should be implemented in a manner consistent with applicable accreditation criteria and quality assurance standards, including the ASCLD/LAB accreditation criteria and the FBI quality assurance guidelines for forensic DNA laboratories.

particular types of evidence -- such as liquids, capsules, and tablets -- that are more challenging to analyze than the routine marijuana and cocaine cases that constitute the overwhelming majority of cases submitted to the Controlled Substances Section. Finally, because of the small number of questioned documents cases, we reviewed all of the cases completed by the Crime Lab's questioned documents examiner during the relevant time period.

We reviewed 36 DNA cases completed by the current Biology Section after ASCLD/LAB accredited the Crime Lab's DNA operation in June 2006. The DNA cases we reviewed included a sample of 30 cases completed between July and October 2006 (which represented approximately half of the DNA cases completed by the Crime Lab during that period) as well as two cases analyzed by each of the three DNA analysts who completed training and began performing casework after October 2006. We also reviewed several "mock" DNA cases analyzed by DNA staff prior to the Section's accreditation.

Finally, we also reviewed the Trace Evidence Section's SOPs, training materials, and equipment and interviewed both of the Crime Lab's current trace evidence examiners. However, because the Trace Evidence Section has not yet been accredited by ASCLD/LAB, we did not review a sample of current trace evidence cases.

I. Management of the Current Crime Lab

In addition to our review of the technical work performed by each of the Crime Lab's forensic science sections, we also assessed issues related more broadly to the management and administration of the entire Lab. As described in detail in this report's discussion of the root causes of the Crime Lab's past failures, we focused on decisions and judgments made over the course of many years by the former senior management of HPD and the Lab. In the past, the Crime Lab was starved for resources, its analytical staff was inadequately trained and suffered from chronically low morale, its managers and staff were not sufficiently integrated into the national forensic science community, there was no formal or effective Lab-wide QA/QC program, and the managers were timid about obtaining resources for the Lab and lacked the vision and will to ensure that the Lab provided high quality forensic science services.

The senior management of the Crime Lab, both in the HPD chain of command above the Lab as well as within the Lab, has undergone a total transformation since the problems infecting the Crime Lab came to light beginning in November 2002. As reflected by, among other things, the commissioning of this investigation, the City and Chief Harold L. Hurtt have made the rebuilding of the Crime Lab a top priority for HPD. Under Irma Rios's leadership, the Crime Lab has been re-organized, has hired and trained a number of new supervisors and analysts in all of its sections, has

re-written all of its SOPs, and has obtained ASCLD/LAB accreditation in almost all of the areas in which it currently performs -- or plans in the near future to perform -- forensic science work.[304]

One of the most encouraging changes that we have observed since our investigation began in April 2005 is in the attitude and morale of the Crime Lab staff. Although many of the analysts are relatively young or new to their fields, we found them to be bright, professional, and enthusiastic about their careers as forensic scientists and about working in the Crime Lab. We were impressed by the high level of respect the Crime Las has for Ms. Rios. We also found that the analysts have confidence in their section supervisors and that, while there are various issues, as there are in any institution, the analysts believe they are supported by their managers and treated fairly. These are extremely important baseline facts about the current Crime Lab that give hope for the future.

Our observations regarding areas of concern for the entire Crime Lab are grouped into the following categories, each of which is discussed below: (1) resources, including the Lab's budget and analysts' salaries; (2) the Lab's QA/QC program; (3) information technology; (4) the Lab's relationships with the users of its services; (5) analyst training and professional development; and (6) strategic planning for the Lab's future.

A. Personnel and Resources

Ms. Rios told us that one of her immediate priorities upon assuming the leadership of the Crime Lab was improving the salaries and career opportunities for Lab staff. Ms. Rios understood from the outset that the only way in which HPD would be able to recover from its past and establish itself as a quality operation was by recruiting and continuously training competent staff who believed, among other things, that the Crime Lab offers realistic opportunities for training and professional growth.[305] As stated in the Houston Police Department Crime Laboratory Career Ladder circulated to Crime Lab staff on August 19, 2005, "[p]ersonnel are recognized as the most critical component of any laboratory system."

---

304 The sole exception is trace evidence examination, for which the Crime Lab received provisional DPS accreditation in November 2006 and underwent an ASCLD/LAB inspection in March 2007.

305 One of the primary recommendations of the NFSTC's Needs Analysis prepared in July 2003 was that an analysis should be performed of the Crime Lab's job descriptions and salary schedules for criminalists.

The Career Ladder states that, in light of the "35% turnover rate for Criminalists [that] occurred in years 2000-2002," HPD and the Crime Lab developed a "career ladder to aid retention." The Career Ladder significantly reorganized the Crime Lab's personnel structure based on the model used by the Texas DPS crime laboratory system. The Career Ladder flattened the structure of the Crime Lab by reducing the number of criminalist positions from four to three -- Criminalist, Criminalist Specialist, and Criminalist Manager. The Career Ladder included revised job descriptions for each of these positions and, in a significant improvement over the Crime Lab's historical salary structure, provided for "[m]erit pay increases . . . based on documented employee performance, ability to fulfill the Houston PD strategic goals, and upon recommendation of the immediate supervisor." The Career Ladder proposed that "at least 30% of employees be given a merit raise on a yearly basis" based on established merit criteria.

On December 14, 2005, HPD's Human Resources Director approved pay grade enhancements for each of the criminalist positions under the revised Career Ladder structure. As reflected in the chart below, the pay grade adjustments resulted in significant increases in the salary ranges for Crime Lab forensic scientists.

Former Job Classification	Pay Grade	Salary Range[306]	New Job Classification	Pay Grade	Salary Range
Criminalist I	16	$24,596 - $48,464	Criminalist	20	$29,926 - $59,956
Criminalist II	19	$28,444 - $56,732	Criminalist Specialist	25	$39,026 - $79,872
Criminalist III	23	$35,022 - $71,084	Criminalist Manager	29	$49,010 - $101,894
Criminalist IV	25	$39,026 - $79,872			

As of March 1, 2007, the Crime Lab organization chart provided for 4 Criminalist Managers, 7 Criminalist Specialists, and 31 Criminalists.[307] With the exceptions of one Criminalist Specialist and one Criminalist position in the Controlled Substances Section, one Criminalist Specialist position in the Biology Section, and two Criminalist positions in the Firearms Section, the Crime Lab has been able to staff its funded positions. The

306 The salary ranges reflected on this chart for both the former and new job classifications are based on the City's posted civilian pay structure, effective March 24, 2007.

307 This organization chart also references one grant-funded Criminalist position in the Biology Section, which was occupied by a serologist who screened evidence in sexual assault kits.

Crime Lab recently hired an experienced forensic DNA analyst from the Harris County ME's office into a Criminalist Specialist position in the Biology Section. Not only does this reverse the historical pattern of the Crime Lab losing qualified personnel to surrounding labs, but it may also reflect the positive effect the Career Ladder is having by improving the Lab's ability to recruit qualified forensic scientists.

It also appears that the Crime Lab's budget has increased substantially compared to its funding levels during the 1990s and early 2000s. As reflected in the chart on page 29 of this report, funding for the Crime Lab from HPD's general budget remained relatively flat during the early 2000s -- $2.93 million in 2000, $3.02 million in 2001, $3.27 million in 2002, and $3.22 million in 2003.[308] The Crime Lab's total budget from HPD's general fund in fiscal year 2006 was $7.66 million -- more than double the funds that had been allocated to it earlier this decade.[309]

Significantly, the Crime Lab's 2006 budget includes line items reflecting that HPD has devoted funds for the training of analysts, including funds to attend training outside of the Lab. The Crime Lab's 2006 budget allocated $19,000 to "education and training," $10,000 to "membership and professional fees," and $14,000 for "travel -- training related." Staff in the Biology Section in particular told us that they are satisfied with the training opportunities afforded them, which has included travel for off-site training, as well as with the resources that have been devoted to rebuilding and maintaining that Section generally.

Two areas of the Crime Lab still in need of additional resources, including additional staff, are the Firearms Section and CER. Two of the Crime Lab's six positions for line firearms examiners currently are vacant, and the Firearms Section is experiencing a significant backlog of more than 600 cases. In order to relieve the Firearms Section of certain demands, the Crime Lab has reassigned types of

---

308 Although the Crime Lab's funding from HPD's general budget declined in 2003 as compared to 2002, the Lab received almost $1.4 million in grant funding that year, including $600,000 allocated by the City Council to analyze the enormous backlog of unprocessed sexual assault kits that had accumulated.

309 The Crime Lab's 2006 budget includes $100,000 in asset forfeiture funds for equipment. This budget includes nearly $2.7 million for management consulting services, a significant portion of which relates to funding for this investigation. Although our investigation has now been concluded and all of the sections of the Crime Lab have received some form of accreditation, funding for outside consultants should not be eliminated from the Lab's budget. As discussed in detail in our recommendations, we believe that the Crime Lab still has a significant need for outside technical consultants -- particularly in the areas of serology, DNA analysis, and trace evidence examination -- to assist the managers and staff of those sections with technical reviews and other quality assurance measures.

examinations traditionally performed by firearms examiners -- namely, serial number restorations and distance determinations -- to the Trace Evidence Section, which, while perhaps necessary in the short term, is not an optimal solution for these examinations. Moreover, because of their current workloads, firearms examiners are not able to participate in professional associations and outside training programs to the extent that they should be. This, too, must be considered to be only a short-term practice.

CER, which is the Crime Lab's central location for receiving, logging, and storing drug evidence, currently is significantly understaffed. CER is staffed by one criminalist, one evidence management clerk, and one contractor. Two additional evidence management clerk positions are vacant. For a number of reasons -- including workload, the volume of evidence that is stored in CER, and environmental issues -- CER is a challenging operation to keep properly staffed. However, even though CER does not perform forensic analysis, it carries out the critical function of processing all of the controlled substances evidence submitted to the Crime Lab for analysis. Therefore, it must be provided with sufficient personnel to manage the large volume of drug evidence submitted to the Crime Lab on a daily basis.

Finally, the Crime Lab has prepared a detailed equipment replacement schedule that plans for the periodic servicing and replacement of instruments and equipment vital to each of the sections of the Lab through fiscal year 2009. Assets included on the replacement schedule are two GC/MS instruments, DNA amplification and analysis instruments, the Biology Section's refrigerator, and equipment related to firearms and trace evidence examination. Such long-term equipment servicing and replacement planning that is embedded into the Crime Lab's future budgets is critical to ensuring that the Lab is properly equipped to maintain appropriate levels of service for the foreseeable future.

B. Quality Assurance and Quality Control

The importance of a robust QA/QC program in a forensic science laboratory cannot be overemphasized. A crime laboratory's quality assurance program must be effective in identifying, documenting, and remedying issues with the technical work performed by the laboratory. Quality assurance also includes ensuring that all of the laboratory's scientists maintain a high level of proficiency in their work, receive proper training and continuing education, and work in a safe and secure environment. A QA/QC manager also is responsible for ensuring that all necessary and appropriate documentation is included in the laboratory's case files, that the files are maintained properly, that the presentation of the laboratory's analytical results are in both its reports and in testimony, and that the laboratory's SOPs and manuals are current and complete.

In October 2003, Reidun Hilleman was appointed the QA/QC Manager for the entire Crime Lab -- a function that had never before truly existed in the Lab.[310] Since then, Ms. Hilleman has been central to HPD's and the Crime Lab's progress in the rehabilitation of the Lab. For example, she has coordinated the revision of each of the sections' SOPs as well as its Quality and Operations Manual, taken the lead role in designing the Lab's QA/QC program, developed systems for administering and tracking proficiency testing for the Lab's forensic scientists, coordinated the Lab's preparations for ASCLD/LAB accreditation inspections, and performed internal quality assurance audits of the Lab's casework. She is a member of the Association of Forensic Quality Assurance Managers ("AFQAM"), an organization whose stated mission is to promote "standardized practices and professionalism in quality assurance management for the forensic community."[311]

1. QA/QC Audits and Inspections

The Crime Lab's current Quality and Operations Manual requires the QA/QC Manager to perform annual laboratory inspections using the ASCLD/LAB accreditation criteria as the reference standards for the inspection.[312] This requirement is consistent with the Crime Lab's general orientation toward, and emphasis on, maintaining compliance with "objective standards," as embodied by the ASCLD/LAB accreditation criteria. While ensuring that the Crime Lab continues to satisfy the ASCLD/LAB accreditation criteria is critical to ensuring that it meets certain fundamental standards relating to quality assurance and maintains its accreditation, this focus on accreditation criteria may be too narrow. Furthermore, ASCLD/LAB inspectors do not issue recommendations. There are a range of best practices over and above the ASCLD/LAB accreditation criteria that sophisticated forensic science laboratories develop over time and incorporate into their SOPs to address specific quality assurance and technical issues that are identified in the laboratory. The Crime Lab's Director and QA/QC Manager must play active roles in assisting the technical leaders and staff of the sections in identifying areas in which the Lab's current practices should be improved and in

---

310 As discussed in the historical narrative section of this report, Mr. Krueger created a QA/QC position in the Crime Lab in 1996 in order to remove Dr. Sharma from the supervision of the DNA/Serology Section. Dr. Sharma never took the position seriously and did little to advance quality assurance in the Crime Lab. In February 2001, Mr. Krueger abandoned the QA/QC position altogether and assigned Dr. Sharma to assist with the analysis of the large volume of marijuana cases submitted to the Crime Lab.

311 The organization's Web site is www.afqam.org.

312 Quality and Operations Manual, Section 300/1.01.

performing any necessary validation studies to support changes in the Lab's practices.[313]

The QA/QC Manager also performs spot reviews of cases analyzed in each of the Crime Lab's sections. Ms. Hilleman estimates that these reviews of randomly selected cases should occupy approximately 50% of her time. However, because of the prodigious amount of work involved in revising the Crime Lab's SOPs and preparing for ASCLD/LAB accreditation inspections, the QA/QC Manager has not yet been able to devote a significant proportion of her time to these reviews. As many other labs have found, additional staffing for the QA/QC function will become necessary. Indeed, the 2003 NFSTC report specifically recommended that the HPD Crime Lab should have two full-time positions dedicated to QA/QC.

Ms. Hilleman's ability to perform spot reviews of randomly-selected cases also is hampered by HPD's current system for tracking cases submitted to the Crime Lab for analysis. With the exceptions of the Firearms and Questioned Documents Sections, the Crime Lab's cases are tracked in an Access database into which cases are entered based on the uniform crime reporting ("UCR") code that a police officer assigned to the investigation to which the evidence relates has specified. In other words, the Crime Lab's current database is not designed to track cases according to the type of evidence submitted to the Lab or the section to which the case is assigned. Rather, cases in the database are coded based on the underlying offense under investigation -- such as homicide, sexual assault, robbery, theft, DWI, etc. For example, suspected drugs recovered at a homicide crime scene may be submitted to the Crime Lab for controlled substances analysis and often are assigned a 01 UCR code for "homicide" rather than the 18 UCR code for "controlled substances." This system makes it difficult for the Crime Lab to maintain accurate statistics regarding the number of cases submitted to and processed by each section of the Lab.[314] A more reliable case tracking system oriented around the work performed in the Crime Lab would enable the QA/QC

---

313 For example, in our discussion below regarding the Biology Section's current operations, we recommend that the Crime Lab perform validation work to calibrate its DNA analysis software to help DNA analysts address certain interpretive issues that we observed in their DNA casework. The QA/QC manager should have a role in overseeing and participating in the recommended validation work.

314 Because of the UCR coding system, we encountered these same complications and difficulties in establishing the sample frames from which PwC selected the case samples for our review of the Crime Lab's historical and current operations. The data in our sample populations required a significant amount of refinement in order to ensure that they captured work performed by the section whose cases we were targeting for review.

Manager to establish a more efficient and systematic inspection system than currently exists.

2. Peer Technical Reviews

Thorough and competent technical reviews of the scientific analyses performed in each case are among the most important elements of any forensic laboratory's QA/QC program. The Crime Lab has adopted a technical review system that permits any analyst who has completed training and passed the required proficiency testing to perform technical reviews of other analysts' work in that area, regardless of the analysts' level of experience. This system also is reflected in the current organization of the Crime Lab, which has essentially abolished the historical Criminalist III line supervisor position in favor of a flattened structure that includes only three levels of criminalist positions: (1) entry level Criminalists, (2) more experienced forensic scientists at the Criminalist Specialist level, and (3) Criminalist Managers (who are the administrative and technical heads of the Controlled Substances/Toxicology Sections, the Biology/Trace Evidence Sections, and the Firearms Section, as well as the QA/QC Manager).

While such peer review systems for technical reviews are permitted under ASCLD/LAB's accreditation guidelines and are used in other forensic science laboratories across the United States, this system may not be appropriate for the Crime Lab at this stage in its recovery and development. Many of the Crime Lab's current forensic scientists -- particularly in the fields of DNA analysis and trace evidence examination[315] -- either are currently undergoing training or have only recently completed training and have limited forensic science casework experience.[316] These analysts still are in the process of mastering the total review of case requirements and interpretive issues that their casework presents on a daily basis and, therefore, require

---

315 Because the Crime Lab currently has only one qualified trace evidence examiner, technical reviews of the Lab's trace evidence cases are performed by an outside expert. However, once the Crime Lab's second trace evidence examiner completes her training and is qualified, the Lab intends that these two newly trained examiners will perform peer technical reviews of each other's work.

316 As discussed below, we also are concerned about the current shortage of experienced supervisory support in the Controlled Substances Section, even though much (but by no means all) of the analysis and interpretation performed by drug chemists is more straightforward and less complex than other forms of forensic science analysis. Because the Firearms Section includes a number of experienced firearms examiners, even at the Criminalist level, we are less concerned at the present time about the appropriateness of peer technical reviews in that Section. The lone questioned documents examiner has an arrangement with outside experts for technical reviews of his cases.

close supervision, guidance, and mentoring by more experienced forensic scientists. We are concerned about the expectations this technical review system imposes on analysts and examiners with slender experience of their own in a crime laboratory whose work is likely to be under close scrutiny for some time as a result of the events of the past several years. High quality technical reviews require, in our judgment, seasoned judgment and substantial experience, ingredients not possessed by even the most talented young analysts.[317]

3. Incident Reporting and Response

The Crime Lab's current quality assurance protocols require that, however they may be discovered, technical problems, deficiencies, or departures from accepted quality assurance standards shall be immediately brought to the attention of the QA/QC Manager.[318] The QA/QC Manager then is required to perform a preliminary review of the incident and recommend to the Laboratory Director whether a formal review is necessary or whether corrective action at the section level is appropriate. If the matter is addressed at the section level, the QA/QC Manager must prepare a memorandum with a summary of the incident and its resolution and include it on an incident log. If a formal review is necessary, the involved analyst is suspended from performing technical work in the relevant analytical area and the analyst's prior casework may be subject to review and corrective action, including re-analysis if appropriate. Serious technical deficiencies must be documented in a corrective action report.

We reviewed the incident log and files maintained by the QA/QC Manager for the period 2006 through early March 2007. We found that the Crime Lab program for reporting and documenting incidents affecting the quality of work performed is vastly superior to the virtually non-existent quality assurance function of the Lab as it existed under the tenure of Mr. Krueger, which ended in early 2003. The incident files included memoranda documenting incidents of various degrees of seriousness, from the failure to perform a monthly check of an instrument, to resolution of routine contamination issues, to technical issues with an analyst's work. The incident memoranda contained in the QA/QC Manager's files were thorough and complete. All of the incidents, including those related to technical errors by a forensic scientist, were resolved through

---

317 As discussed in detail below, we identified specific technical issues, especially in the Biology Section, in several DNA cases that were not identified by the Crime Lab's current technical review and quality control regime. In our view, this is concrete evidence of the potential pitfalls of a system built largely on peer technical reviews.

318 Quality and Operations Manual, Section 500/3.01.

coordination between the QA/QC Manager and section leaders without the involvement of IAD, whose role in addressing the Crime Lab's issues in the past had a devastating effect on analysts' morale.[319]

The current QA/QC regime relies heavily on section supervisors and analysts to identify and report technical and other quality assurance problems. Moreover, the Crime Lab only has one staff member devoted full time to its quality assurance program, the QA/QC Manager. Although communication between the QA/QC Manager and the section leaders appears to be good, this system has potential weaknesses -- particularly in the disciplines of DNA analysis and trace evidence examination -- relating to the identification and remediation of technical problems in analysts' work. As discussed above, because the Crime Lab permits peer technical reviews rather than requiring that technical reviews be performed by experienced supervisors, there is the potential that technical issues will not be recognized and that the Lab's relatively inexperienced analysts will not receive the necessary level of technical guidance.

C. Information Systems

When she assumed the leadership of the Crime Lab, Ms. Rios recognized that, in addition to salary and budget issues, one of the most significant challenges facing the Lab related to its information and technology systems. As discussed above, HPD has provided the Crime Lab analysts with personal computers, and the forensic science instrumentation used by the analysts is modern and in good condition. However, the evidence tracking, case management, and laboratory reporting systems currently in use by the Crime Lab are archaic and very poorly suited to the information systems needs of a forensic laboratory. These are all problems of which HPD is aware, and plans are currently underway to provide the Crime Lab with a modern laboratory information management system ("LIMS"), which will be integrated with a Department-wide records management system ("RMS") that is in the relatively early stages of development.[320]

---

319 Although it is both appropriate and preferable for technical problems identified in an analyst's work to be addressed by the Crime Lab's internal quality control procedures, under certain circumstances the involvement of IAD investigators may be appropriate. Such circumstances should be limited to cases involving allegations of serious misconduct (as opposed to technical or analytical errors), including, for example, potential scientific fraud, knowingly making false statements during testimony, or theft of evidence.

320 HPD intends for the RMS system to replace OLO as the central investigative file system. HPD's vision for the RMS is an electronic filing system that can store information in a variety of formats, including .pdf documents, digital photographs, and video and sound files. HPD envisions the

Footnote continued

A LIMS is a computer software application that forensic laboratories use to manage work flow from the receipt of evidence, assign unique identifiers to samples, record test data and results, and generate statistics about the laboratory's caseload and performance. Such systems are absolutely critical to the proper management of modern forensic laboratories.

The Crime Lab does not currently have an electronic system for tracking evidence that has been submitted to the Lab and for tracking samples that have been tested. It relies on a paper-based system for tracking the chain of custody. Crime Lab analysts use paper forms to record evidence sample identification information, as well as the results obtained by tests performed on each sample. The analytical files also are maintained entirely in paper form.

The other significant technological impediment facing the Crime Lab is the use of HPD's archaic OLO reporting system, which was first implemented as HPD's central investigative records system in the mid-1980s. It operates on a UNISYS mainframe and consolidates all incident-based information, including the Crime Lab's final reports, into a central database repository. The Crime Lab's "lab reports" are actually supplemental reports entered into an OLO investigative file, along with other supplemental reports entered by officers (such as reports regarding crime scenes and witness interviews) as the investigation progresses.

OLO is poorly suited to be the reporting system for the Crime Lab. In addition to the fact that the Crime Lab's laboratory reports are not clearly identified as such, OLO does not permit forensic scientists to enter important charts or tables -- particularly important in the area of DNA analysis -- into the entirely text-based system, which is a very significant limitation. Specifically, OLO does not permit DNA analysts to include with their reports a table identifying the alleles detected at each locus for each sample tested, which is the standard reporting practice of most forensic DNA laboratories. As a result of the limitations inherent in OLO as a reporting system (HPD's implementation of which pre-dates forensic DNA analysis), the Biology Section has been forced to adopt extremely cumbersome reporting conventions in order to convey the allelic results it obtains through DNA testing of evidence and reference samples. Without the ability to include an allelic table with their lab reports, the DNA analysts are deprived of using a reporting tool that would allow them to easily and clearly present their DNA profiling results in a way that would permit the reader to

---

Footnote continued from previous page

RMS being integrated into an electronic evidence tracking system for the Property Room, as well as into the Crime Lab's planned LIMS.

easily understand consistencies (and matches) between the DNA profiles they obtained.[321]

Finally, the OLO system causes complications when it comes to correcting or amending a Crime Lab report. Once a report is entered into OLO and designated as "complete," it is locked into the system and can be amended only by an authorized records management process pursuant to a rigid protocol. In order to protect the integrity of OLO as the Department's central investigative records system, HPD's general policy is that amendments to supplements (including Crime Lab reports) entered into the system should be made by creating a new supplemental report that is designated as superseding the earlier supplement. However, the earlier, superseded supplemental report remains unaltered in the OLO file. This creates confusion where, as discussed below, we observed in many DNA cases in all sections that analysts entered reports into OLO before the cases had undergone technical or administrative review.

D. Relationships with Users of the Crime Lab's Services

The Crime Lab needs to continue building its reputation with investigators as a provider of reliable and valuable forensic services that can help them clear cases and identify perpetrators. To address this need, the Crime Lab has begun promoting its current forensic capabilities within HPD by holding meetings with HPD commanders and groups of investigators. However, as discussed below, certain types of analytical work performed by the Crime Lab -- including questioned documents examination and toolmark examination -- are vastly underutilized by HPD investigators.[322]

There is room for increased coordination between Crime Lab analysts and investigators. As discussed below, there is a need for better communication between investigators and Crime Lab analysts, particularly in the areas of DNA, trace evidence, and controlled substances analysis, regarding setting priorities for and triaging evidence samples to be analyzed. Also, in too many DNA cases, the Crime Lab is not

---

321 Because of the importance and usefulness of allelic tables to the reporting of DNA test results, the practice of Crime Lab DNA analysts is to distribute an allelic table (sometimes typed, sometimes handwritten) to investigators along with a hard copy of the report entered into OLO. It is unclear whether these allelic tables are always, in turn, provided to prosecutors and to the representatives of defendants.

322 We do not suggest that the burden of ensuring that investigators take advantage of the full range of forensic science services offered by the Crime Lab rests solely with the Lab. HPD command staff must ensure that investigators are aware of the Crime Lab's capabilities and that those capabilities are used as fully as possible in investigations.

provided with reference samples from victims, suspects, or consensual partners in sexual assault cases for comparison to the DNA profiles obtained from evidence samples, despite requests from analysts for such reference samples. In cases in which there is a suspect or a known potential contributor to a sample, but reference samples are not provided to the Crime Lab for comparison, the potential for highly probative DNA analysis may be wasted. HPD command staff should emphasize to investigators the importance of obtaining and submitting reference samples as a critical step in obtaining the maximum benefit of the investigative potential offered by the Crime Lab's DNA operation.

The standing of the Crime Lab within HPD can be improved by increasing the Lab's responsiveness to investigators. The Crime Lab has made some significant strides in this area, but there is room for further enhancement. The Crime Lab should actively consider methods to keep investigators apprised of the status of cases submitted, explaining the reasons for any delays, providing realistic estimates as to when results are likely to be ready, and notifying investigators when a report has been issued and entered into OLO.

Finally, among the responsibilities of the Crime Lab is the education of investigators and prosecutors about forensic science work. Particularly, but not exclusively, in the area of DNA analysis, the Crime Lab should be proactive in training investigators and prosecutors in understanding the science and technology underlying the Lab's analyses and results. For example, DNA analysts have a role in training homicide and sexual crimes investigators, as well as prosecutors, to understand the reports issued by the Biology Section so that law enforcement officials have a firm grasp of the significance of the results obtained and reported by the Crime Lab.

E. Strategic Planning for the Crime Lab

For the past several years, the Crime Lab and HPD command staff responsible for support operations have been focused primarily on revising the Lab's SOPs, hiring qualified analysts, and preparing the Lab to obtain and maintain accreditation. For example, the only specific goal for the Crime Lab included in a document entitled "Support Operations Short & Longterm Goals for FY 07 Through Second Quarter (July 2006 -- December 2006)" -- the most recent strategic planning document relevant to the Lab -- was to "maintain Crime Lab accreditation standards by satisfactorily passing an independent inspection." Now that all of the current sections of the Crime Lab have received some form of accreditation and are able to issue reports, HPD command staff and Lab managers must turn their attention to developing a strategic plan for a full-service forensic science laboratory.

F. Recommendations

Based on the above observations, we have the following global recommendations regarding the current management and operations of the Crime Lab.

1. Funding and Staffing

Funding levels for the Crime Lab must be maintained at least at current levels as adjusted for inflation and the addition of new personnel. As discussed below, the Crime Lab must fill currently vacant forensic science staff positions. As these positions are filled, the Crime Lab's overall budget must be adjusted proportionately upward so that equipment and other resources available to all of the analysts and sections in the Lab are not adversely affected by the addition of new staff. Moreover, the Crime Lab must maintain at least its current ratio of funding per criminalist, adjusted annually for inflation and growth in the number of analysts in the Lab, devoted to training and professional development activities.

The Crime Lab's current budget includes significant allocations for outside consultants, which the City and HPD may be tempted to eliminate or substantially reduce in light of the Lab's accreditation and the conclusion of this investigation. However, as discussed below, because of the relative inexperience of many of the staff, the need for further technical improvements in some areas, and the heightened scrutiny to which the Crime Lab will continue to be subjected, the Lab still has a significant need for outside technical assistance, including technical reviews, particularly in the areas of DNA analysis and trace evidence examination.

It also is critical that the Crime Lab rapidly fill all vacancies in forensic science staff positions and:

- Hire (or promote internally) at least one additional experienced controlled substances analyst who can assist with the supervision of the Controlled Substances Section, and hire at least one additional controlled substances line analyst.

- Hire (or train) two qualified and experienced firearms examiners.

- Hire at least two additional inventory management clerks to work in CER. HPD and the Crime Lab also should consider whether salary adjustments for CER staff would be appropriate in light of the difficulty staffing these positions due to the nature of the work -- handling significant volumes of drug evidence -- and the associated environmental issues.

Finally, one consequence of the "flattened" organizational structure implemented in connection with the Crime Lab's career ladder is that the delineation between supervisors and bench analysts is less clear than it was under the Lab's former organization. The Crime Lab must ensure that an appropriate "span of control" -- or ratio between supervisors and subordinates -- is maintained in each of the sections. The appropriate span of control varies by section -- for example, a higher ratio of analysts to supervisors is more appropriate for the Controlled Substances Section than for the Biology Section. However, each section must be adequately staffed by supervisors whose daily job duties include providing technical guidance and job performance feedback to bench analysts.[323]

2. Quality Assurance

The Needs Analysis Report prepared by the NFSTC for the Crime Lab in July 2003 recommended that HPD establish two positions dedicated to quality assurance. We support this recommendation. The current QA/QC Manager should be provided with a qualified staff person, preferably with a background in or familiarity with the technical aspects of forensic serology and DNA analysis.

We recommend that the QA/QC Manager and Crime Lab supervisors and staff implement the following measures to formalize and refine the Lab's current QA/QC program.

- Develop a defined methodology for the selection of cases from each of the sections of the Crime Lab to be periodically reviewed by the QA/QC staff. The methodology should be designed to include samples of the work performed by every analyst and examiner in the Crime Lab. The QA/QC Manager, in consultation with section leaders, should develop a checklist of issues to be covered in each case review and complete the checklist for each case reviewed. The QA/QC staff should prepare a report for section leaders and the Crime Lab Director summarizing the results of each review, identifying specific technical and administrative issues that should be addressed, and identifying any trends or Lab-wide issues that are apparent as a result of the reviews.

- In addition to reviews of paper files, the random case inspection process should include the periodic selection of a small number of cases from each section to be re-analyzed or re-examined by a forensic scientist other than the original staff member who worked on the case.

---

323 Where appropriate below, we make specific observations and recommendations with respect to the current supervisory and technical review structure of the individual sections.

- The QA/QC Manager should prepare a monthly written report for the Crime Lab Director that summarizes all QA/QC activity for the previous month, identifies any quality assurance-related incidents, discusses any observed declining or improving trends in performance, and contains recommendations regarding areas for improvement or issues that the Lab should address.

- In addition to the incident log and files currently maintained by the QA/QC Manager, the QA/QC Section should develop a spreadsheet database that tracks each quality-related incident that occurs in the Crime Lab (including the date of the incident, its nature, and involved personnel) the staff members assigned to address the incident; the remediation efforts, if any, that were taken; and the date on which the incident is deemed resolved. The QA/QC Manager should include the current incident tracking spreadsheet with the monthly reports provided to the Lab Director.

Crime Lab staff who attend outside training and professional development activities should be required to report during section- or Lab-wide meetings on issues covered during the programs that relate in some way to QA/QC. Crime Lab staff also should be encouraged to provide their section leaders and the QA/QC Manager with any recommendations for improving the Lab's procedures or practices stemming from the programs.

The Crime Lab should reconsider its system of peer technical reviews, particularly in the areas of DNA analysis and trace evidence examination, where the vast majority of staff members are newly trained and newly qualified in their disciplines. We recommend that the Crime Lab retain highly qualified and experienced forensic science consultants to perform technical reviews of the Lab's work in these areas, as well as to train and mentor the supervisors and staff in those sections specifically on performing technical and administrative reviews of forensic casework.

3. Information Systems

HPD and the Crime Lab have long understood the urgent need for the Department to improve its information systems related to case management and evidence tracking. We are advised that HPD is in the process of retaining vendors to design a LIMS for the Crime Lab as well as a Department-wide RMS and that the City and HPD have hired consultants to assist HPD in defining the requirements of these

systems and to help oversee their development. With respect to the information system needs of the Crime Lab, the new systems should include the following capabilities:[324]

- The LIMS should apply to all sections and be integrated into the Department-wide RMS to provide a unified system for tracking the location and status of evidence on which forensic analysis may be performed. This integration must not compromise the effectiveness of the system for the Crime Lab.

- The LIMS should manage and track evidence items, as well as monitor work flow in each of the sections and Lab-wide.

- The LIMS should provide the Crime Lab with the ability to track cases based on the type of analysis performed on the evidence, as opposed to the current system that is based on UCR codes assigned by investigators based on the underlying offense. The LIMS should support the QA/QC program in efficiently selecting cases for random inspection.

- The LIMS, in combination with the Crime Lab's other information systems, should provide Lab managers with reports and information necessary to evaluate the Lab's performance, including case turn-around times by section, the number and types of tests conducted by Lab analysts, court appearances, subpoenas and court orders received by the Crime Lab, time spent by Crime Lab staff on activities other than casework, and analysts' training and performance.[325]

In the meantime, while the LIMS is in development, we recommend that the Crime Lab take the following measures to contend with the limitations of the OLO system:

- Reports issued by the DNA Section should include a statement that an allelic table has been prepared and is incorporated as part of the Crime Lab report. This allelic table should be provided to all users of the Crime Lab report, including investigators, prosecutors, representatives of a suspect or defendant, and the court.

---

324 Our discussion regarding the Property Room includes additional recommendations regarding functionality that should be included in the RMS and electronic evidence tracking systems that HPD also is in the process of developing.

325 HPD reports that each of these recommendations regarding LIMS functionality is addressed in its RFP for the new LIMS.

- Crime Lab staff should stay in regular contact with investigators via telephone and email communications to apprise them of the status of cases submitted for analysis. Notice via telephone or email should be provided to investigators when a report has been entered into OLO.

- The Crime Lab should have analysts prepare printed draft reports on their desktop computers prior to entering the report into OLO. These draft reports should be administratively and technically reviewed, and any resultant changes to a report should be made, before the report is entered into OLO.

4. Relationships with Users of the Crime Lab's Services

The Crime Lab already has begun meeting with investigators to disseminate information about the range of services offered by the Lab and to educate officers about forensic science. We recommend that the Crime Lab continue to enhance those efforts and:

- Provide training to new police recruits at the HPD training academy about the Crime Lab, forensic science, and understanding the Lab's reports.

- Provide similar training periodically to officers and investigators through HPD's in-service training program.

- Hold meetings with executive command staff and senior officers in the investigative and patrol commands to promote the services offered by the Crime Lab and to obtain feedback regarding the Lab's performance.

- Although it is generally not necessary for Crime Lab personnel to be regularly involved in processing crime scenes, analysts should, as part of their continuing training, periodically observe crime scenes so that they understand the methods used by HPD investigators to collect evidence that may be submitted for forensic analysis.

- Trace evidence examiners should regularly consult with investigators about potential trace evidence to be recovered from crime scenes.

- Crime Lab analysts should be involved in training programs for prosecutors regarding forensic science and understanding the results generated by the Lab, particularly, but not exclusively, in the area of DNA analysis. HPD and the Crime Lab should consider offering to provide similar training to members of the criminal defense bar.

5. Strategic Vision for the Crime Lab

Now that each section of the Crime Lab has received some form of accreditation and is reporting casework, Lab managers should focus on what comes next. The Crime Lab, based on input from all supervisors and staff, should develop a strategic plan which is updated annually that includes goals and objectives, as well as action plans to achieve them. Crime Lab personnel should be assigned specific responsibilities for advancing the articulated goals and objectives. Some areas that the Crime Lab should consider addressing in its strategic plan include:

- Recruiting analysts and examiners.
- Increasing its profile in national and regional forensic science and professional organizations.
- Promoting and expanding the existing services it provides.
- Evaluating new technology, equipment, and forensic science analytical techniques.
- Making improvements in the areas of security, health and safety, biohazards, and contamination.
- Identifying improvements the Crime Lab can make to manage caseload, process evidence, and transfer evidence (particularly drug evidence) not needed for analysis out of the Crime Lab.
- Integrating the Firearms and Questioned Documents Sections into the Crime Lab.[326]

II. The Biology Section

The Crime Lab's Biology Section, which includes serology and DNA analysis, has undergone a substantial transformation over the four and a half years sincethe DNA Section was closed in December 2002. Among other things, the Biology Section is

---

326 HPD reports that the Crime Lab has taken steps relevant to each of the areas listed above, and, to varying degrees, it has. Our recommendation that the Crime Lab periodically prepare a strategic vision document, however, is meant to encourage the Lab to develop a formal system for defining its goals and measuring its success in achieving them. We expect that the Crime Lab's strategic vision will change over time, and the areas listed above for the Lab to consider in setting its current objectives are by no means exhaustive.

under new leadership, has substantially improved SOPs (based primarily on the SOPs used in the Texas DPS crime laboratory system), and has trained a promising group of new DNA analysts. The Section resumed performing casework again last year after receiving provisional accreditation from ASCLD/LAB in June 2006, an important and necessary step for the Biology Section of the Lab. We closely reviewed the DNA Section's current operations, including 36 DNA cases completed by the Section since accreditation.

We note that the current DNA Section bears no resemblance to the entity that produced the shoddy, flawed, and unprofessional work during the period before its operations were closed in December 2002 and whose work we have described at length above. With that being said, our overall assessment is that the current operations of the Biology Section reflect a mixed picture of substantial strengths and significant weaknesses when it comes to evidence examination, body fluid identification, and DNA typing. The Section performs very good work with respect to evidence documentation, the mechanics of DNA extraction, and DNA typing. However, there is significant room for improvement with respect to certain aspects of the Section's approach to analyzing forensic cases, result interpretation, and report writing.

While the DNA Section has made very significant strides in a relatively short period of time, we observed a number of areas in which the Crime Lab's technical work and administrative processes can be further improved so that, with focused attention and continuing commitment from leadership in HPD and in the Crime Lab, the DNA Section can become more technically sophisticated and contribute more significantly to the criminal justice system in Harris County. We have formulated a number of recommendations, all of which are intended to assist the Crime Lab in generating and presenting DNA profiling results that would be less vulnerable to criticism by attorneys and outside experts and would provide even greater value to investigators and the criminal justice system.

A. The Current Operations of the Biology Section

The Crime Lab did not perform DNA analysis in active investigations or report DNA typing results between December 2002 when the DNA Section was closed following its first outside inspection and June 2006 when ASCLD/LAB granted provisional accreditation to the rebuilt and reorganized DNA Section. During this 41-month moratorium on in-house DNA testing by the Crime Lab, HPD outsourced DNA testing to various public and private laboratories at significant expense. During this time, the Crime Lab has almost completely replaced its serology and DNA staff through recruitment of new personnel and transfer of personnel previously assigned to the DNA Section. Only one of the current DNA analysts was employed by the Crime Lab prior to 2003, and she was not in the DNA Section then. The need to rebuild

virtually from scratch -- including hiring a new management team and recruiting entirely new DNA analysts -- is the reason why it took more than three years for the Crime Lab to bring its DNA operation back on line. Analysts in the Crime Lab's Biology Section during this period were occupied primarily with inventorying and screening biological evidence, training in serology and DNA testing, validating the Lab's equipment, and working with Lab managers to revise the Section's SOPs.[327]

In the more than three years since HPD discontinued performing DNA analysis, the Crime Lab has revamped the way in which it processes, analyzes, and reports analytical results related to forensic biological evidence. The time it has taken for HPD and the Crime Lab to bring in-house DNA analysis back on-line reflects both the shockingly poor condition of the DNA Section in the early 2000s and the time and care necessary to rebuild the Section in accordance with the most basic principles for DNA analysis generally accepted in the forensic science community.

The most significant changes that we have observed in the Crime Lab's DNA operation are described below:

- **Support of the Department**. HPD has shown a commitment to restoring and improving the Crime Lab's DNA analysis capability. The independent investigation is itself a reflection of HPD's resolve to identify fully the problems with the Crime Lab's historical DNA operations and to ensure both that those issues have been identified and addressed and that the Department has a set of recommendations for the Section's further development and future success. In stark contrast to the state of the DNA Section prior to its closure, the morale of the analysts who comprise the current Biology Section appears to be very high.

- **Leadership in the Biology Section**. The management and supervision of the Biology Section has been reorganized and staffed with entirely new personnel. The Criminalist Manager and Technical Leader of the Biology Section, Vanessa Nelson, holds a doctorate in medical sciences and was a DNA analyst in the Texas DPS crime laboratory system.[328] The Biology Section is supervised also by a Criminalist Specialist, Karen Lewis-Holmes, who is designated as a case manager for the Section. Finally, the Crime Lab recently hired a second

---

327 The current Biology Section includes serology -- i.e., the screening of biological evidence and DNA extractions -- and DNA analysis.

328 The position of Criminalist Manager is the equivalent of the Criminalist IV position in the historical Crime Lab.

Criminalist Specialist to assist with the supervision of the Section's line DNA analysts and to perform casework.

- **Line DNA Analysts**. The Biology Section currently is staffed with eleven DNA Criminalists and one Criminalist Specialist who will be performing DNA casework. Almost all of these bench analysts have been trained in-house by the Biology Section's management staff following the Crime Lab's DNA Training Manual, and they have undergone proficiency testing. While almost all of the Biology Section's line analysts are young and relatively inexperienced in forensic DNA testing, they are a promising, eager, and cohesive unit with high morale and pride in the Section and in the Crime Lab.

- **Revised Standard Operating Procedures**. The Crime Lab's current "Standard Operating Procedures: DNA" are a vast improvement over the historical SOPs for the DNA Section. Unlike the DNA Section's historical SOPs, the Biology Section's current SOPs are not merely a cookbook of techniques cobbled together from various sources.[329] The current DNA SOPs are well organized, detailed, and in a form consistent with the SOPs of modern forensic DNA laboratories. The current DNA SOPs describe various analytical procedures in detail and provide guidance to analysts in addressing circumstances that may arise during the course of forensic casework.

- **Facilities**. The roof over the HPD headquarters building has been repaired, and the Biology Section's work no longer is exposed to leaking water. The layout of the Crime Lab has been reorganized to provide additional space for the Biology Section, including a separate room dedicated to evidence examination. The Biology Section also now has its own walk-in freezer for the storage of sexual assault kits and other evidence.

- **Instrumentation**. The Biology Section's DNA profiling platform is comprised of ABI Prism 310 and 3100 Genetic Analyzer instruments, which operate in conjunction with the Identifiler PCR amplification reagent kit. This is a modern and sensitive forensic DNA profiling system. Each analyst has been issued a personal computer, and the Section is equipped with a digital imaging system to capture the appearance of evidence submitted to the Crime Lab for analysis.

---

329 The current DNA SOPs are derived substantially from the SOPs used in the Texas DPS crime laboratory system, which is not surprising since the head of the Crime Lab and the Technical Leader over the Biology Section both are former DNA analysts in the Texas DPS system. However, the DNA SOPs have been customized and tailored somewhat by the Crime Lab.

- **Consultation with outside experts**. In March 2006, HPD retained Dr. Robin Cotton as a consultant to provide "DNA training and oversight services" to the Biology Section. Dr. Cotton is a well-known leader in the field of forensic DNA analysis with over 17 years of experience in forensic DNA testing and laboratory supervision. During the period of her consultancy with the Crime Lab, between March 2006 and the end of February 2007, Dr. Cotton reviewed and commented on the Biology Section's SOPs, met frequently with DNA analysts, and provided numerous training sessions covering a range of topics, including applicable standards and guidelines, technical and analytical issues, and court testimony.

- **Accreditation**. The Biology Section received provisional ASCLD/LAB accreditation in June 2006. This accreditation was a significant accomplishment for the Biology Section, the Crime Lab, and HPD, and it reflects acceptance of the Crime Lab's DNA operation back into the forensic science community. The Biology Section began performing and reporting DNA casework soon after being accredited, and the Crime Lab achieved another significant milestone in February 2007 when the Lab was approved to enter DNA profiles into CODIS.

B. Review of the Biology Section's Current Operations

While ASCLD/LAB accreditation is an important and necessary step for the Biology Section of the Crime Lab, it reflects only that the Section meets the baseline requirements necessary to perform credible DNA testing. The City and HPD requested that we review the current operations of the Biology Section to identify areas in which the Crime Lab's forensic DNA unit could be further improved. The goals of our review, and the purpose of our recommendations, are to help position the Biology Section to provide superior, high quality forensic DNA testing; to identify practices that might be vulnerable to attack or criticism by attorneys and outside experts; to suggest areas in which the Biology Section could contribute further to HPD investigations; and to reduce the likelihood of a significant error that might nullify the substantial efforts the City and HPD have made to restore the Crime Lab's credibility.

Our observations and recommendations regarding the Crime Lab's current forensic DNA profiling work are based on a thorough and comprehensive review of the Biology Section's operations that involved: (1) review of the Lab's Quality and Operations Manual, (2) review of past NFSTC and ASCLD/LAB inspection reports, (3) review of the Lab's Biology Section and DNA SOPs, (4) review of instrument and software validation studies performed by the Biology Section, (5) review of the instrument maintenance manuals and logs maintained by the Lab, (6) review of the Biology Section's Training Manual and the training binders maintained by the first group of DNA analysts to be approved for casework, (7) review of DNA analysts' work on mock and adjudicated cases completed prior to accreditation, (8) review of

proficiency test results, (9) review of personnel files, (10) interviews and meetings with Biology Section supervisors and staff, (11) observation of DNA analysts as they processed mock cases from evidence screening through reporting, and (12) review of 36 forensic DNA cases completed and reported by the Lab after the Biology Section received provisional ASCLD/LAB accreditation in June 2006.[330]

C. Assessment of the Biology Section's Current Operations

The forensic DNA work currently performed in the Biology Section is vastly superior to that performed by the DNA Section during the 1993-2002 period both in terms of the quality of the Biology Section's analytical work and the accuracy and reliability of its reported results. The Crime Lab's current staff of DNA analysts, who as a whole are relatively inexperienced, received thorough training in forensic DNA analysis before being approved to conduct casework. Our review found no evidence of the selective reporting that was endemic to the historical DNA Section. We also found no evidence that the cases we reviewed were affected by contamination, and we further found that the Biology Section's current quality assurance procedures for preventing and addressing contamination are sound. We observed that Biology Section analysts use proper controls during their STR testing and take appropriate precautions during their analysis to minimize the possibility of contamination. Although, as discussed below, we have recommendations intended to refine and improve the power and relevance of the Biology Section's statistical calculations related to its forensic DNA profiling results, we note that DNA analysts now properly calculate and report random match probabilities based on the alleles detected in evidence and have abandoned the DNA Section's indefensible historical practice of preparing statistical calculations based on known reference samples. Finally, while we also have recommendations for improving the Biology Section's current process for technical reviews, such reviews now are consistently performed and documented in each of the Biology Section's cases.

Even though the Biology Section today bears little resemblance to the historical DNA Section and is now accredited by ASCLD/LAB, we identified a number of areas in which the work of the Crime Lab's DNA analysts is vulnerable to criticism or in which the Section's procedures and practices could be further improved and refined. We recognize that re-establishing the Crime Lab's forensic DNA analysis capability has been a complicated process that has required HPD's and the Crime Lab's leadership to make judgments about what is appropriate for the Biology Section in terms of its

---

330 Thirty of the DNA cases we reviewed were completed by the Biology Section during the period July 2006 (after the Biology Section was accredited) through October 2006. We reviewed an additional six cases completed by DNA analysts who completed their training and were approved for casework after October 2006.

organization and revised procedures. The observations and recommendations that follow are intended to build upon the Crime Lab's and Biology Section's impressive progress to enable the Section to produce the highest quality, most reliable, and most sophisticated forensic DNA work possible.

Our observations regarding the Biology Section's current operations focus on the following five areas: (1) forensic evidence recognition; (2) identification of semen stains; (3) interpretation of DNA results, particularly with respect to alleles that appear to be in a "stutter" position; (4) the reporting conventions used by the Biology Section to describe its DNA typing results; (5) the calculation of frequency estimates; and (6) the technical and administrative review processes.

1. Forensic Evidence Recognition

Case assessment -- meaning the continuous, overall consideration of the significance of evidence and the test results obtained from the evidence -- is a critical aspect of the forensic analysis of biological evidence. The ability to sort through a case in order to recognize potentially significant and probative items of evidence is one of the fundamental challenges facing forensic scientists. Evidence recognition requires experience, an appreciation for the range of analytical techniques available in a crime laboratory, and an understanding of investigative theories regarding relationships between suspects, victims, and specific items of evidence. Rather than blindly processing potentially irrelevant or insignificant evidence that may be submitted to a crime laboratory by investigators, efficient and probative forensic science work requires the analyst to understand the circumstances under investigation and the pertinent questions to be answered through the analysis of forensic evidence. By appreciating the context for and relationships surrounding an item of evidence, the forensic DNA analyst is equipped to perform meaningful scientific testing that has the potential to contribute to the investigative process by either supporting or challenging investigative information about the underlying incident and the crime scene.[331]

During our evaluation of the Biology Section's current casework, we reviewed three sexual assault cases in which DNA analysts performed DNA typing on evidence that the Crime Lab should have recognized, given the statements of the victims and information provided by investigators, would be unlikely to yield probative

---

331 Needless to say, the forensic scientists must be guided solely by the results of forensic testing, not by outcomes dictated or suggested by investigators, prosecutors, or suspects. However, familiarity with how particular items of evidence fit into investigators' theories about a case equips the forensic scientist with the information necessary to test investigators' theories in light of data obtainable from physical evidence.

information about the assaults. Furthermore, the analysts overlooked other pieces of evidence in these cases which, if tested, might have generated valuable information. Each of these cases would have benefited significantly from a better coordinated and more thoughtful approach to the selection of evidence to be tested and the assessment of the significance of the results obtained.

For example, in one of these cases, the victim reported that her assailant digitally penetrated her and made oral contact with her breasts. In addition to the standard samples collected during sexual assault examinations, including a vaginal swab, the sexual assault nurse examiner ("SANE") collected a breast swab from the victim. Information included with the sexual assault examination forms also indicated that the victim had consensual sex shortly before the sexual assault. In light of these facts, which were available to the DNA analyst, it should have been apparent that DNA typing of sperm on the vaginal swab included in the sexual assault kit was unlikely to be associated with the assault. Nevertheless, the DNA analyst in this case extracted DNA from spermatozoa on the vaginal swab, compared the DNA profile obtained to the suspect's known reference sample, and eliminated the suspect as a potential contributor to the vaginal swab evidence. The analyst did not examine or attempt to type the victim's breast swab, which actually had potential to yield a profile from the suspect in light of the allegation that he made oral contact with the victim's breast. The analyst in this case also failed to type a swab made of the victim's fingernail, although this swab was, rather inexplicably, screened for semen. Finally, the analyst prepared a CODIS entry form containing the profile developed from the sperm on the vaginal swab, which is highly likely to have originated from the recent consensual partner reported by the victim.[332]

This case, and the two others similar to it among the 36 cases we reviewed, reflect a somewhat mechanical and uncritical approach to working a forensic DNA case. This lack of critical thinking may be attributable to the relative inexperience of many of the Biology Section's DNA analysts.[333] The guidance given to the DNA analysts in the Biology Section is that, in sexual assault cases, analysts generally should begin testing with the most intimate samples, such as vaginal swabs. In many sexual assault cases,

---

332 It seems obvious, based on the facts reported by the victim, that the profile detected on the vaginal swab likely was associated with the consensual partner. However, if the analyst harbored any doubt, it would have been appropriate to attempt to obtain a reference sample from the consensual partner to compare to the profile prior to its entry into the CODIS database.

333 We were advised that, after we brought our observations regarding these cases to the attention of the Biology Section's supervisors, the Crime Lab revisited the cases to assess whether further analysis would be appropriate. Crime Lab managers advised us that they have encouraged Biology Section analysts to review the SANE report before processing sexual assault kit evidence.

this approach may well make sense because the identification of a suspect's DNA profile in evidence obtained from the victim's vaginal swab is potentially powerful evidence of penetration, which is a statutory element in certain serious sex crimes.[334] However, if this blanket approach is mechanically applied by the analyst in every sexual assault case, without consideration of the specific facts and circumstances of each case, always focusing on the most intimate samples may lead an analyst to waste time and resources on the analysis of irrelevant samples at the expense of potentially probative evidence.

In addition, as reflected in the above-referenced sexual assault cases in which breast swabs potentially containing a suspect's saliva were not analyzed, the Biology Section could take better advantage of the investigative power of forensic DNA analysis by screening for and testing possible saliva stains in appropriate cases. The Biology Section's SOPs do not provide for testing procedures to characterize possible saliva stains.[335] Presumptive testing for amylase, an enzyme present in saliva, typically requires the consumption of a minimal quantity of a sample and aids analysts in determining whether potential typeable saliva is present in certain evidence samples.[336] Because the current SOPs do not provide guidance about screening for potential saliva stains, Crime Lab analysts may be overlooking a widely-recognized source of

---

334 There are disadvantages to samples extracted from vaginal swabs, however. Even after the application of differential extraction techniques, profiles obtained from vaginal swabs often are mixtures including a substantial amount of DNA from the victim relative to the amount of DNA attributable to semen that may be present. Thus, a profile obtained from semen on a vaginal swab often is a mixed profile that is less informative than, for example, a more concentrated semen sample extracted from the victim's undergarments. Although the semen stain on the victim's clothing may be less intimate than a sample from a vaginal swab, the male profile obtained from such evidence frequently is much cleaner and, therefore, generates a more powerful random match probability.

335 In certain cases, characterization of a stain as indicating the presence of saliva has the potential to answer forensically relevant questions. For example, if amylase testing indicates the presence of saliva in a mixed saliva-semen stain found on a sexual assault victim's clothing, this information can corroborate the victim's statement that forced oral copulation took place. Also, as in the alleged oral contact cases discussed above, amylase testing indicating the presence of saliva on a breast swab can provide a framework to explain why a DNA profile found on that swab is consistent with coming from the suspect. We do not suggest that routine amylase screening is appropriate in every case, but it is a forensic tool that should be in the Crime Lab's repertoire

336 There is no direct test for saliva. Rather, an amylase test, similar to the p30 and AP presumptive tests for semen, merely provides an indication that saliva may be present in a stain.

potentially valuable evidence, particularly in sexual assault and homicide investigations.[337]

2. Issues Associated With Semen Identification

With the exception of lacking tests to characterize possible saliva stains, the Biology Section staff uses standard methodology to identify biological evidence such as blood or semen. This is a critical step in the analysis of biological evidence because the identification of a stain as blood or semen can provide important information as to what may have happened during a crime. For example, under the right circumstances, identifying semen on a victim's vaginal swab from a sexual assault evidence kit provides important information to substantiate the charge of sexual assault. Because the presence of semen is crucial information in the prosecution of a sexual assault case, this testing must be done accurately. Based on our review of the Crime Lab's current DNA cases, we developed some concerns that (1) in certain cases, Biology Section staff did not detect spermatozoa that may in fact have been present in semen stains and (2) in other cases, there might not have been a sufficient basis for an analyst's positive identification of semen. There are two reasons for our concerns regarding the Crime Lab's work on this issue.

First, we observed an unexpectedly high number of cases (8 of the 30 cases in our original sample) where an analyst identified "semen" in stain evidence based on a positive p30 test, and yet the analyst's microscopic examination of the sample did not result in the detection of any spermatozoa. Although finding a semen stain that does not contain spermatozoa is certainly possible (such as in the cases where the donor of the semen stain is a vasectomized male), the number of samples that we encountered that had been characterized in this manner appeared to us to be unusually high.

Second, we reviewed 5 cases in which an analyst recorded the finding of semen in a sample, and yet the analyst was unable to detect a male or foreign DNA profile when the sample was typed. Ordinarily, the use of a differential extraction, in combination with the sensitivity of the modern PCR-based typing used by the Crime Lab, means that it is highly unusual not to detect *some* male DNA in a semen mixture. The positive identification of "semen" in these cases usually was based on the results of a p30 "card" test. Although the p30 card presumptive test for semen is widely used by forensic laboratories, there are concerns in the forensic science community about the test's specificity. Indeed, for this reason, some laboratories, unlike the Crime Lab, do

---

337 The DNA SOPs describe techniques for the extraction of DNA from saliva samples on evidence items such as swabs, gauze, cigarette butts, envelope flaps, and stamps.

not permit their analysts to base an identification of semen solely on a positive p30 card test.

3. DNA Results and Interpretation

We found that the DNA analysts in the Biology Section produce usable and reliable typing results from forensic evidence, including items from difficult cases involving extractions from marginal samples such as hairs or a swab from a bite mark. Importantly, we found no significant issues with contamination at any stage in the DNA analysis process.[338] The Biology Section staff carefully follows the current SOPs, and they maintain well-organized and well-documented case files.[339] We also found that, with very few exceptions, the Biology Section processed evidence submitted to the Crime Lab for DNA analysis in a reasonable amount of time. These are significant and important accomplishments.

However, we identified one significant issue with the Biology Section's interpretation of DNA typing results in certain cases. We reviewed three cases in which DNA analysts had difficulty under the Biology Section's current SOPs in properly interpreting STR signals that appeared to be in a "stutter" position and that, therefore, likely do not reflect actual alleles present in the sample. The misinterpretation of stutter had a dramatic affect on the results reported by the Crime Lab in these cases.

"Stutter" is an issue commonly encountered by forensic DNA laboratories in connection with modern STR testing. Stutter refers to artifacts resulting from the PCR

---

338 The incident files maintained by the Crime Lab's QA/QC Manager recorded three discrete contamination incidents in the Biology Section between June 2006 and March 2007. Each of these incidents was reported to the QA/QC Manager and the incidents, as well as the remedial measures taken to resolve the contamination issues, were properly documented.

339 We found that DNA analysts typically do not include in their paper case files all of the electropherograms reflecting the results of each of the test runs performed in a case. The DNA case files usually include a list of all of the injections run by the analyst, but only those electropherograms that support the results and conclusions that ultimately are reported by the Crime Lab are actually contained in the case file. Biology Section managers told us that the Crime Lab retains all electropherograms for each test performed electronically and that technical reviewers are supposed to review even the electropherograms that are not included in the paper case file in order to evaluate fully the testing and interpretation in each case. Because all of the electropherograms associated with a case are not included in the case file, it would be difficult for an outside reviewer to assess whether the most appropriate electropherograms were, in fact, being used for final data interpretation and reporting based solely on the contents of the paper case file. It is unclear whether technical reviewers actually review all of the electropherograms related to each case and whether the electronically-stored electropherograms are routinely made available to prosecutors and to counsel and experts for defendants.

amplification process of STR loci. These stutter artifacts cause signal peaks on electropherograms that appear to be, and may be difficult to distinguish from, actual alleles.[340] Because stutter artifacts are a relatively common phenomenon and stutter is reproducible for each STR locus, modern DNA analysis software is designed to filter out peaks that fall below an established stutter threshold so that the software does not label stutter peaks as actual alleles. However, if the stutter filters are not appropriately defined in the DNA analysis software, the filters will not be as effective in screening out stutter artifacts. As a result, the DNA analysis software may label stutter artifacts as actual alleles, causing interpretive complications for the DNA analyst.

We reviewed three cases in which a single allele at a stutter position, usually with a low rfu value, was identified as an allele by the Biology Section's DNA analysis software. In each of these cases, the analyst relied on the allele calls generated by the software and interpreted a likely stutter peak as an actual allele. The interpretation of stutter artifacts caused the DNA analyst to report either a false mixture or a false partial profile that unnecessarily complicated the Crime Lab's conclusions in each of these cases. Moreover, each of these cases underwent a technical review that concurred with the reported DNA profiling results.

For example, in one case relating to an alleged sexual assault, tests run on the epithelial fraction extracted from the victim's vaginal swab detected a full DNA profile matching the victim as well as a single extraneous allele at the D5 locus that was not consistent with either the victim's or the suspect's known profile at that locus.[341] Based on our review of the electropherogram on which the analyst's findings in this case are based, this extraneous allele at the D5 locus appeared to be in a position indicating that it was a stutter artifact -- in other words, that it was illusory rather than real. This extraneous allele, detected at the D5 locus in the epithelial fraction of the vaginal swab, caused the DNA analyst to interpret the presence of a mixed profile with an unknown contributor. The analyst reported:

> The DNA profile from the epithelial cell fraction of Item L (vaginal swab) is consistent with a mixture. [The victim] cannot be excluded as the source of the major component in this DNA mixture. No conclusion will be made for the allele at D5S818. [The suspect] is excluded as a

---

340 Stutter peaks on electropherograms result when DNA repeats that are being copied through the PCR amplification process slip out of register so that the DNA fragment that is produced is one repeat shorter than the actual target DNA fragment.

341 "D5" is shorthand for the D5S818 locus, which is one of the thirteen standard CODIS STR loci commonly used in forensic DNA analysis.

contributor to the DNA profile from the epithelial cell fraction of Item L (vaginal swab).

In other words, based on the interpretation of a single extraneous allele at the D5 locus, the analyst indicated, without expressly concluding, that a third person other than the victim or the suspect might have contributed to the sample taken from the rape kit vaginal swab in this case.[342] The much more likely explanation for the single extraneous allele in this case is stutter.

As a result of the interpretation of the extraneous D5 allele as an actual allele and the conclusion that, therefore, there is a mixed profile in the epithelial fraction of the vaginal swab, the analyst's DNA testing results in this case are unnecessarily vulnerable to the characterization that there is an unknown contributor to the DNA evidence who is neither the victim nor the suspect. If questioned about these results while on the witness stand, the analyst would have to either (1) acknowledge the possibility of a third, unknown contributor who is neither the victim nor the suspect -- who in all likelihood does not actually exist -- or (2) attempt to explain why the reported "mixture" actually probably resulted from an artifact of the amplification process and, therefore, there likely was no unknown contributor to the sample. Either path would be fraught with potential embarrassment for the analyst and the serious possibility that the forensic DNA evidence in this case could be mischaracterized and misunderstood, to the detriment of the underlying criminal prosecution.

We found that the Crime Lab's current DNA SOPs do not adequately equip Biology Section analysts to address stutter. The DNA SOPs explain the cause of stutter peaks and provides stutter peak height ratios for each of the 15 loci targeted by the Identifiler reagent kit. Although the DNA SOPs provide that, "[i]f a stutter peak exceeds the published percent stutter associated with each locus and there is no other indication of a mixture, the analyst may call that locus inconclusive," this guidance was not effective in allowing Biology Section DNA analysts to avoid interpreting non-existent mixtures or partial profiles in three of the cases we reviewed. [343]

---

342 As discussed in more detail below, this case also is an example of the awkward and unnecessarily convoluted way in which, based on the guidance provided in the DNA SOPs, Crime Lab analysts sometimes state their conclusions. For example, it is rather absurd to state that the victim "cannot be excluded" as the source of the "major component" of the epithelial fraction of the vaginal swab when, except for the extraneous D5 allele that probably is a stutter artifact, the victim clearly was the sole source of the full profile detected in the epithelial faction, as one would expect her to be.

343 DNA SOPs at section 11.3.3.3. The "published percent stutter" referenced in the DNA SOPs appears to refer to default stutter filter settings provided for in the Identifiler kit.

In light of the history of the Crime Lab, the relative inexperience of most of the Biology Section's current staff, and a commitment to being "conservative" in the interpretation of DNA results, the managers of the Biology Section are extremely reluctant to provide DNA analysts with the discretion to disregard certain alleles labeled by the analytical software even where a signal on the electropherogram appears to reflect stutter rather than actual genetic data. This desire to be "conservative" by limiting analysts' discretion in the interpretation of DNA typing results generated by the Section's instruments and software is understandable and not necessarily incorrect. However, in three of the cases we reviewed, the particular approach taken -- namely, interpretation of all alleles that exceed the published stutter percent associated with each locus -- resulted in the reporting of inaccurate DNA profiling results.[344] This outcome is not "conservative" and may have the opposite of its intended effect -- the approach may make the Crime Lab's DNA results in some cases unnecessarily weak, confusing, or vulnerable to challenge.

An approach that many top-flight forensic DNA laboratories take to minimize the effect that stutter may have on the interpretation of DNA typing results is to perform rigorous, well-documented validation studies designed to support adjustments to the default stutter filter settings included with their DNA analysis software.[345] Through well-designed and thoughtfully executed validation of the DNA analysis instrumentation and software, the Crime Lab could generate reliable statistical data that reflects the Biology Section's actual experience with stutter. It would be appropriate for the Biology Section to adjust and customize the "published" stutter filter settings applied by its DNA analysis software based on such rigorous and reliable validation

---

344 HPD has commented that, in the cases we reviewed, it is not possible to differentiate a "stutter" signal from a true allele due to the contributors in the cases. While it is not possible based on the electropherograms to distinguish between stutter and a real allele, as detailed above, in the cases giving rise to our concern (1) the potential stutter peak appeared at a locus (e.g., D5) in other Crime Lab cases and (2) the potential stutter peak was the only signal indicating the presence of another contributor. Further, it is clear that at least some of the Biology Section staff were aware that stutter was a potential issue in these cases because an analyst in two of these cases made the notation "stutter called as an allele."

345 The Biology Section has performed validation studies for its instruments and software. However, while these validation studies are sufficient to allow the Crime Lab to proceed with the analysis of evidence, we found that the Crime Lab typically uses validation work as a training device and that very little statistical analysis has been performed on the data obtained from these studies. Rigorous validation studies, including focused statistical analysis of validation data, likely will yield useful information that the Biology Section can use to fine tune its instrumentation and refine its procedures. Two areas in particular in which the Crime Lab likely would obtain useful information relevant to its DNA testing through additional validation experiments are (1) DNA extraction methods and (2) peak height ratios and stutter filter settings.

studies. This approach would significantly minimize the frequency with which stutter artifacts are labeled as actual alleles, thereby minimizing interpretive problems, without granting individual analysts the discretion to pick and choose the alleles to be interpreted, which we agree should be avoided.

4. Reporting Language

Laboratory reports are the final work product of a forensic crime laboratory, and they are extremely important documents for investigators, prosecutors, suspects and defendants, defense attorneys and experts, judges, and juries. Parties reviewing these reports will make critical decisions based upon their understanding of the information contained therein. Accordingly, the laboratory report must, to the maximum extent possible, stand on its own without the need for clarification or further explanation. Moreover, the information in the report must clearly and concisely convey to a lay audience: (1) the samples that were tested, (2) the results of tests performed on the samples tested, and (3) the significance of those findings. One of the most important responsibilities of the Crime Lab is to condense a large amount of complex and sometimes highly technical data into accurate, meaningful, and understandable conclusions.

We found that Biology Section DNA analysts are extremely faithful in conforming to the DNA SOPs' guidance regarding the organization of, and the language to be used in, the Crime Lab's DNA reports. The issues we identified relate to the reporting conventions and language prescribed by the DNA SOPs themselves. We found that the analysts' strict conformity to the reporting guidance provided in the DNA SOPs often resulted in a presentation of the analysts' results that was convoluted, imprecise, and, in certain cases, inadvertently inaccurate. The awkwardly-stated conclusions appearing in many of the Crime Lab's DNA reports are difficult to understand.

For example, the DNA SOPs' reporting conventions even for single source inclusion results -- i.e., DNA profiling results that reflect a single contributor and that match a known individual's DNA reference profile -- are cumbersome and confusing:[346]

> For evidentiary profiles that meet the single source criteria, an inclusion shall be reported using this wording:

---

346 The following language is quoted from the DNA SOPs, section 13.1.2.2, "Inclusion - Single source."

> "The DNA profile from *Item 1, stain 3*, is consistent with the DNA profile of *Person A*. *Person A* cannot be excluded as the contributor of the stain [. . .] at loci *D3S1358, vWA, FGA, Amelogenin, D8S1179, D21S11, D18S51, D13S317, D7S820, D16S539, TH01, TPOX, and CSF1PO. At these loci,* . . .] the probability of selecting an unrelated person at random who could be the source of this DNA profile is approximately 1 in __ for Caucasians, 1 in __ for Blacks, and 1 in __ for Hispanics."
>
> **AND**
>
> "To a reasonable degree of scientific certainty, *Person A* is the source of *Item 1, stain 3* (excluding identical twins)"
>
> **OR**
>
> "The approximate world population is 6,300,000,000."

A more concise statement of DNA results reflecting a single source inclusion that is similar to the language used by many DNA laboratories in such cases would be:

> The DNA profile from *Item #1* matches the DNA profile of *Person A*. The probability of selecting an unrelated person at random who could be the source of the DNA profile obtained from *Item #1* is approximately 1 in __ for Caucasians, 1 in __ for African Americans, and 1 in __ for Hispanics.

The unnecessary and convoluted verbiage contained in the DNA SOPs model reporting language is the product of two factors. First, the Crime Lab has decided not to use the term "match" in single source inclusion cases. Instead, the Crime Lab uses an awkward convention involving an initial use of the term "consistent with" followed later by either a source statement or a statement of the world population.[347] This is an unnecessarily indirect approach to describing very powerful DNA test results that establish an individualized association between a person and the evidence.[348] Even

---

347 Although the DNA SOPs do not permit the use of the word "match," they do provide that a source statement will be included when the calculated random match probabilities for the evidence sample exceed a frequency threshold of 1 in 273 billion. The DNA SOP provides that, "[f]or significance estimates that are 1 in at least 273 billion for every population group calculated, the significance statement will identify the source. If the source is not identified, the report will state the population of the world at least once."

348 The Crime Lab is not alone among forensic DNA laboratories in avoiding the use of the term "match," even though use of the term in single source inclusion cases is accurate, generally accepted in the forensic science community, and more easily understood by lay people.

without using the term "match," however, the Biology Section could make its reports significantly clearer by, in single source inclusion cases, discarding the initial "consistent with" statement and using only the source statement already provided in the DNA SOPs -- i.e., "To a reasonable degree of scientific certainty, *Person A* is the source of *Item 1, stain 3* (excluding identical twins)."

Second, due to the technical limitations of HPD's archaic OLO reporting system, the Crime Lab's DNA reports do not include an allelic table summarizing the DNA test results obtained at each locus. To compensate for the Crime Lab's inability to accompany a simply stated conclusion with an allelic table, the DNA SOPs require analysts to embed in their written conclusions a list of up to 15 particular loci at which the DNA profile obtained from an evidence sample "is consistent with" the reference profile. As reflected by the model language quoted above, the result is a virtually unreadable conclusion that is not easily understood by investigators, attorneys, and other lay people.

While the model reporting language provided under the DNA SOPs is confusing even in a simple single source inclusion case, the Biology Section's reporting conventions can become virtually incomprehensible in complex cases involving multiple samples and mixture profiles. Below is an extreme example, from a report issued by the Crime Lab in a homicide case:

> Item 10 (swabs from red plastic cup) was submitted as a possible reference sample. The DNA profile from Item 10 is consistent with a mixture. The DNA profile of the major component of this mixture is consistent with an unknown male individual and no conclusion will be drawn as to the source of the minor component of this mixture.
>
> The DNA profiles from Item 5A (swabs labeled 'A'), Item 5B (swabs labeled '#1'), and Item 8 (2 swabs labeled 'serology sample') are consistent with the DNA profile of the unknown male individual who contributed to the major component of the DNA profile on Item 10 (swabs from plastic cup). The unknown male individual who contributed to the major component of the DNA profile on Item 10 (swabs from red plastic cup) cannot be excluded as the contributor to the DNA profile on Item 5A, Item 5B, and Item 8. [Complainant] is excluded as a contributor to the DNA profiles on Item 5A, Item 5B, and Item 8. The DNA profiles for Item 5A will be entered into CODIS.
>
> The partial DNA profile from Item 3 (Rt. Foot slipper cutting) is consistent with a mixture. The unknown male individual who contributed to the major component of the DNA profile on Item 10 (swabs from red plastic

cup) cannot be excluded as the contributor to the DNA profile of the major component in the partial DNA profile at loci D8, D3, Tho, D13, D16, D19, vWA, Amel., D5, and FGA. No conclusions will be drawn as to the source of the minor component of this mixture. [Complainant] is excluded as a contributor to the DNA profile on Item 3.

The DNA profile from Item 4 (swabs from pliers) is consistent with the DNA profile of [Complainant]. [Complainant] cannot be excluded as the contributor to the DNA profile on Item 4 at all loci except D21 and D2. At all loci except D21 and D2, the probability of selecting an unrelated person at random who could be the source of the DNA profile is approximately 1 in 519.2 quadrillion for Caucasians, 1 in 28.51 quadrillion for African Americans, and 1 in 4.137 quintillion for Hispanics * (* = D2 and D19 excluded for frequency estimates). To a reasonable degree of scientific certainty, the [Complainant] is the source of Item 4 (excluding identical twins). The male individual who contributed to the major component of the DNA profile on Item 10 (swabs from red plastic cup) is excluded as a contributor to the DNA profile on Item 4.

The DNA profile for Item 5C is consistent with the DNA profile of [Complainant]. [Complainant] cannot be excluded as the contributor……the probability.. .122.3 quintillion for Caucasians, 1 in 733 quintillion for African Americans and 1 in 1.256 sextillion for Hispanics. To a reasonable degree of scientific certainty [Complainant] is the source of . . .

No conclusive or interpretable DNA profiles were obtained for Item 1 (swabs from glasses).. .

A more concise and understandable way to express the Crime Lab's DNA profiling results in the same case would be:

The Crime Lab received following items for DNA analysis:

#1: glasses
#2: L. slipper
#3: R. slipper
#4: pliers
#5A: 2 swabs – "A"
#5B: 2 swabs –"#1"
#5C: 2 swabs
#6: Envelope "glass"
#7: Envelope "hairs"
#8: 2 swabs "serology samples"
#9: blood card – [Complainant]
#10: "red plastic cup" – [Suspect]

> Swabs from a red plastic cup (Item 10) were submitted as a possible reference sample for [Suspect]. The DNA profile obtained from Item 10 is a mixture. The major component of this mixture is consistent with having originated from a male. Hereafter in this report, swabs from the red plastic cup (Item 10) will be referred to as "Possible Suspect Reference."
>
> The DNA profiles obtained from Items #5A, #5B, and #8 are consistent with the DNA profile obtained from the "Possible Suspect Reference." [Complainant] is excluded as a contributor to the DNA profiles from Items #5A, #5B, and #8.
>
> The partial DNA profile obtained from Item #3 is a mixture. The major component of the mixture is consistent with the DNA profile obtained from the "Possible Suspect Reference". [Complainant] is excluded as a contributor to the DNA profile from Item #3.
>
> The partial DNA profile obtained from Item #4 is consistent with the DNA profile of [Complainant].
>
> The DNA profile obtained from Item #5C matches the DNA profile of [Complainant].[349]
>
> No meaningful conclusion can be drawn from the DNA profile obtained from Item #1 due to the limited quantity and/or poor quality of DNA obtained.
>
> The DNA profile from Item #5A will be entered into CODIS.

In a more clearly presented laboratory report, the above conclusions would be accompanied by an allelic table showing the alleles detected at each locus for each item of evidence tested.

5. Frequency Estimates

DNA testing is extremely discriminating and is capable of providing very strong evidence that a specific individual is the source of a particular blood or semen evidence

---

349 Although the Crime Lab in its report provided frequency estimates for the DNA profile obtained from Items #4 and #5C, doing so probably was unnecessary. As discussed in the following section, although there might be exceptions in particular cases, including frequency estimates for DNA profiles matching the victim, particularly in evidence such as swabs taken from the victim, generally is not probative and is potentially confusing.

sample. As described in our discussion of the historical operations of the Crime Lab's DNA/Serology Section, forensic DNA analysts express the strength of the association of an individual with a specific sample of biological evidence through the calculation of a frequency estimate known as a random match probability. The random match probability can be understood as the probability with which two unrelated people could share the same DNA alleles at a particular locus or across a series of DNA loci. DNA analysts calculate the probability of a random match for the alleles identified at each locus and then combine the results for all the loci to calculate a random match probability over the entire DNA profile.

As discussed above, one of the most common and most critical errors we observed in the DNA cases worked in the Crime Lab during the 1993-2002 period was the calculation of frequency estimates based on a suspect's known reference sample -- rather than the DNA profile found in the evidence -- even in cases where the evidence contained a mixture of two or more DNA profiles. Not only is such a calculation completely irrelevant to the DNA profiles found in the evidence samples, in many cases -- especially mixture cases -- the statistics reported by the historical Crime Lab greatly exaggerated the strength of the association between the biological evidence and the suspect in nearly two dozen of the past cases we reviewed.

The current Biology Section does not calculate random match probabilities based on known reference samples, which is a correction of one of the most serious errors routinely committed during the 1993-2002 period. However, based on our review of cases analyzed and reported by the current Biology Section, the Crime Lab's relatively inexperienced staff should continue training in this area in order to become more sophisticated in their understanding and use of frequency estimates in their DNA casework and reports. We identified two specific issues concerning the Biology Section's current calculation and use of frequency estimates.

First, we found that current DNA analysts routinely calculate frequency estimates to demonstrate the inclusion of a victim to the epithelial (i.e., female) cell fraction of her own sexual assault evidence, such as the vaginal swab.[350] A random match probability, calculated to demonstrate the inclusion of a victim's DNA profile to an identical profile obtained from the epithelial cell fraction of her own vaginal swab, is completely irrelevant to the question of who may have committed the reported sexual assault. In other words, calculating the strength of the association between a sexual

---

350 We reviewed eight sexual cases in which the Crime Lab calculated and reported a frequency estimate for the epithelial cell fraction of evidence, such as a vaginal swab included in the victim's sexual assault kit.

assault victim and her own secretions on the vaginal swab does not address the questions that investigators turn to the Crime Lab to help answer. These questions include: Is there DNA foreign to the victim present in the sexual assault kit? And, if so, can the foreign DNA profile be associated with a suspect? A skilled defense attorney or expert witness could use the inclusion of such irrelevant information in the DNA reports to portray the DNA analyst as unsophisticated or to attack the Crime Lab's reported results as either meaningless or an attempt to distract the fact finder with astronomical statistics that bear no relationship as to who may have committed the alleged crime.[351]

Second, although the Identifiler kit used by the Biology Section's DNA analysts obtains very discriminating information for the D2 and D19 loci, the Crime Lab does not include the D2 and D19 loci in its calculation of frequency estimates.[352] Analysts typically include an asterisk in their written reports indicating that the alleles detected at D2 and D19 were not used in the calculation of the reported random match probability. The reason D2 and D19 are not included in the Biology Section staff's frequency estimates is that the version of the PopStats software that the Biology Section uses to calculate frequency estimates does not include information from these loci in its calculations. However, frequency data for D2 and D19 are readily available, and frequency estimates for these informative loci could be included in the frequency calculations used to generate frequency estimates for probative evidence samples. Inclusion of statistical information based on these two loci would be particularly valuable in cases involving mixtures or partial profiles. The failure to perform calculations for D2 and D19 in such cases means that the Crime Lab essentially is disregarding potentially valuable DNA profile information obtained from evidence.[353]

---

351 Biology Section managers told us that frequency estimates based on the epithelial fraction of sexual assault evidence are included in the Crime Lab's DNA reports because prosecutors on occasion have requested this information. Rather than include these meaningless statistics in the Crime Lab's file, and thereby potentially expose the analyst to unnecessary criticism, we would suggest that the DNA staff attempt to educate prosecutors about the irrelevancy of the requested information and the advantages of limiting the Lab's reports to material and potentially probative information.

352 D2 and D19 are shorthand for the D2S1338 and D19S433 loci, respectively.

353 Biology Section managers told us that the DNA staff is uncomfortable performing manual calculations because of the risk of a mathematical or computational error. Of course, any calculations reported by the Crime Lab must be correct. However, it would be preferable for the Biology Section analysts to receive training in statistics and frequency estimates so that they are comfortable performing manual calculations rather than routinely disregarding potentially valuable DNA profile data.

6. Administrative and Technical Reviews of Casework

As discussed above, a significant failing of the Crime Lab's historical DNA/Serology Section was the lack of meaningful and documented technical reviews of bench analysts' work. Indeed, for a period of over six years prior to the closure of the DNA/Serology Section in December 2002, there was no line supervisor devoted to reviewing the technical work performed by the Crime Lab's DNA analysts. Although Mr. Bolding purported to be the technical leader of the Section during this period, the DPS audit in December 2002 revealed that he was not qualified to be a DNA technical leader under the DAB guidelines. Regardless of his lack of qualifications, there is no evidence that Mr. Bolding actually performed regular technical reviews of the work performed in the historical DNA/Serology Section. The rampant and fundamental problems we found with the quality of the forensic DNA analysis performed at HPD during the 1993-2002 period make clear that, even if Mr. Bolding occasionally did perform technical reviews, those reviews were completely ineffective due to Mr. Bolding's incompetence as a DNA supervisor.

The current Biology Section's DNA SOPs require that "[a]ll case files and reports will be administratively and technically reviewed prior to release from the laboratory."[354] We found that administrative and technical reviews in fact are performed and documented in each of the Crime Lab's current DNA cases.[355] The current practice of performing administrative and technical reviews in each DNA case processed by the Crime Lab is consistent with generally accepted forensic science principles and is a significant improvement over the historical DNA/Serology Section's case review and quality assurance regime.

However, the area of greatest risk for the Biology Section currently is in the technical review process for its DNA casework. We found that there is room for significant improvement in this critical aspect of the Crime Lab's QA/QC processes. Specifically, we found that (1) the Biology Section's forms do not sufficiently distinguish between administrative and technical reviews, which have very different purposes; (2) the Crime Lab's practice allows analysts' reports to be entered into HPD's OLO reporting system prior to completion of both of these reviews; and (3) the Biology Section does not require that technical reviews be performed by sufficiently experienced personnel.

---

354 DNA SOPs, section 2.6.

355 Although, as discussed below, the Biology Section's current practice is to permit administrative reviews to be performed after the analyst's report is entered into the OLO system and released from the Crime Lab.

First, administrative and technical reviews typically consider very different aspects of a DNA case. An administrative review evaluates the laboratory report and supporting documentation for completeness and editorial correctness. A technical review should focus on whether the scientific interpretations and conclusions made by the analyst are adequately supported and correct. Moreover, these reviews should evaluate every aspect of the analytical work performed in a case to ensure that forensic DNA evidence is fully exploited to assist investigations of very serious crimes. The current case review checklist does not identify this critical aspect of case management as an area to be covered by either the technical or the administrative review. Properly performed technical reviews require both a high level of technical acumen and an abundance of forensic case experience.

Despite the differences between the two types of reviews, the Biology Section currently uses a single form as a reference checklist for the performance of both administrative and technical reviews. With the exception of two items reserved only for the technical review, the checklist of items to be covered by the administrative and technical reviews is identical.[356] However, as discussed above, administrative and technical reviews are quite different, and they should not be treated as equivalents in the forms used by the Biology Section or in the minds of the Section's analysts and supervisors. The substantial overlap between these two reviews, reflected on the form, risks diluting the significance of each review process as well as the staff's ownership and accountability over these important tasks.[357]

Moreover, five of the 36 DNA cases we reviewed involved the issuance of supplemental reports to correct mistakes that appeared in the original report entered into OLO, and thereby published within HPD and to the District Attorney's Office. These mistakes included an incorrect frequency estimate, a CODIS entry issue, spelling mistakes, and mislabeled evidence. In some of these cases, multiple amended reports had to be issued. The DNA SOPs require that reports be technically and administratively reviewed before they are released from the Crime Lab. Whether this

---

356 The only two areas that are included as items to be covered by the technical review and not by the administrative review are "New project made for raw data & plots match" and "Primer peaks present in neg control and all [reagent blanks]."

357 Biology Section managers told us that, in light of the relative inexperience of the staff currently performing both the analytical work and the technical reviews, the administrative review currently is intended to be virtually a second technical review. We agree that a thorough technical review of the Biology Section's work is necessary. However, a practice that essentially makes administrative and technical reviews redundant risks diminishing the quality of both reviews, as well as the accountability of reviewers, who might be less vigilant in light of an overlapping review performed by someone else.

requirement was not followed in these cases or whether the reviews that were performed prior to entry of the original report into OLO failed to detect the errors, these cases created a situation in which corrections or edits had to be made through an amended supplemental report entered separately into the OLO system.[358] Issuance of amended reports to correct issues identified in administrative reviews creates unnecessary and preventable opportunities for the Crime Lab's work to be criticized by attorneys and outside experts.

Finally, and most importantly, technical reviews of the Biology Section's casework are not currently being performed by sufficiently seasoned and experienced forensic DNA scientists. Indeed, many of the 36 cases we reviewed had been technically reviewed by a peer analyst. The DNA SOPs section entitled "Technical Reviewer Qualifications" require only that:

> Technical reviews should be conducted by a second analyst qualified (or previously qualified) in the DNA platform currently in use in the laboratory. Reviewing analysts should have 6 months of Genetic Analyzer experience or have attended ABI 310 Genetic Analyzer school prior to assuming technical reviewer duties.[359]

In other words, under the Crime Lab's current regime, any analyst in the Biology Section who is qualified to perform DNA analysis is also qualified to perform technical reviews. This is an extremely low threshold of qualification for technical reviewers, which, in our view, is not appropriate, in light of the inexperience of the current Biology Section staff.[360]

Newly qualified analysts, including most of the current Biology Section staff, are too inexperienced in forensic DNA casework to be expected to identify and evaluate

---

358 Once the Crime Lab enters a report into the OLO system and the report is accepted by the system, it cannot be modified. Therefore, an amendment or correction to the report must be entered into the OLO system as a separate supplemental report.

359 DNA SOPs, section 2.6.1.

360 Crime Lab managers explained to us that they permit even the most inexperienced "qualified" Biology Section staff to perform technical reviews so that the staff gains experience reviewing the technical work of other analysts. While it is certainly important that DNA analysts benefit from reviewing the work of other analysts, it is our view that the more appropriate means by which analysts acquire the skills necessary to perform high quality technical review are by (1) analyzing a large and diverse body of forensic DNA cases over a period of years, (2) paying close attention to the technical reviews of their own work performed by more experienced DNA analysts, and (3) receiving mentoring and training specifically directed toward technical reviews.

reliably the myriad technical issues involved in DNA analysis, as well as to assess whether available DNA evidence has been fully obtained and exploited. As stated above, we found the current Biology Section staff to be bright, eager, and appropriately trained to begin forensic casework. However, as a whole, they are not prepared to assume the critical role of technical reviewer. We fear that permitting these inexperienced analysts to perform this important function substantially defeats the purpose of this review.

In apparent recognition of the relative inexperience of the Biology Section staff members who currently are performing both DNA casework and technical reviews, the Biology Section's practice has been that either the Criminalist Manager of the Biology Section or the DNA case manager perform an "administrative" review of each DNA case that actually includes a full, second technical review of the analytical work performed in the case. Although the purpose of this informal system of secondary technical reviews -- to have a more experienced forensic DNA analyst review the work of newly trained staff members -- is respectable, this approach to technical reviews is problematic. This system contributes to a blurring of the distinct roles of administrative and technical reviews and diminishes the accountability of technical reviewers.

Moreover, and more importantly, we have concerns as to whether the Criminalist Manager and DNA case manager are able, in light of their other responsibilities and the Biology Section's growing caseload, to perform the exacting and detailed technical reviews that the Section's casework requires. For example, the Criminalist Manager, who is by far the best qualified and most experienced DNA analyst currently in the Biology Section, is responsible for, among other things, the daily administrative management of both the Biology and Trace Evidence Sections and overseeing the training of all DNA personnel.

The DNA case manager should be actively coordinating the review and analysis of DNA cases with analysts and investigators, as well as assisting with the daily management of the Biology Section. Both of the Biology Section senior supervisors are extremely competent, devoted to the success of the Section, and very well respected by the Section's staff. However, as discussed above, we have observed certain analytical and interpretive issues in the Crime Lab's DNA profiling work, and we are concerned that the current supervisory structure of the Biology Section is not sufficient to provide the close technical oversight necessary for the Section during these critical early years as the Crime Lab re-establishes the credibility of its DNA profiling work.[361]

---

[361] As discussed above, in March 2006, HPD retained the services of Dr. Robin Cotton to provide training and oversight for the Crime Lab's DNA staff pursuant to a consulting agreement that

Footnote continued

D. Recommendations

Based on our review of the Biology Section's current operations, we have developed the following recommendations for HPD and the Crime Lab, which are designed to address the issues we identified with respect to certain aspects of the Section's approach to case analysis, body fluid identification, result interpretation, and report writing.

1. Technical Reviews

We recommend that HPD retain an outside consultant to assist the Crime Lab in performing technical reviews of the DNA work performed by analysts in the Biology Section.[362] The outside consultant should have the following qualifications and responsibilities:

- The consultant should have a minimum of 10 years' experience as the technical leader of an accredited forensic DNA laboratory and in the performance of technical reviews of forensic DNA casework.
- The consultant, who should be retained by HPD for a period of at least two years, should report directly to the Biology Section's Criminalist Manager.
- The consultant should perform the technical reviews of all of the cases reported by the Crime Lab that involve forensic DNA analysis.
- The consultant should mentor the Biology Section's supervisors in the technical review process.

Footnote continued from previous page

expired at the end of February 2007. The original intention of the consulting agreement, as reflected in the related RFP issued during the summer of 2005, was that Dr. Cotton would function as "an external DNA Technical Leader" for the Biology Section and, among other things, "conduct a technical review of a maximum of 20 DNA cases per month." In September 2005, however, the Crime Lab hired a full-time technical leader for the Biology Section. Accordingly, although Dr. Cotton provided extensive technical consulting and training services to the Biology Section, she never functioned as the Section's technical leader and she did not perform technical reviews of any of the Section's DNA cases.

362 As stated in the introduction to our discussion of the Crime Lab's current operations, all of our recommendations should be construed consistently with applicable accreditation criteria and quality assurance standards for forensic laboratories. All of our forensic experts are veterans of the forensic laboratory process -- collectively, they have participated in hundreds of accreditation reviews. None of our recommendations is in any way inconsistent with ASCLD/LAB standards.

- The consultant should assist the Biology Section's supervisors in mentoring staff on technical issues related to DNA analysis and in performing technical and administrative reviews.

- The consultant should assist the Biology Section in performing and analyzing the validation studies recommended below.

- The consultant should work with Biology Section managers to improve the clarity and precision of the DNA reports issued by the Crime Lab. A significant step in improving the comprehensibility of the Crime Lab's DNA reports would be to include a typewritten allelic table with all reports.[363]

- The consultant should review the Biology Section's training program, the Crime Lab's QA/QC program as it relates to the Biology Section, and the Biology Section's SOPs.

- The consultant should ensure that DNA reports are not entered into the OLO system until after both the technical and administrative reviews of the case have been completed.

2. Forensic Case Management

The Biology Section currently has a Criminalist Specialist who is designated as the Section's case manager. We recommend that the Biology Section case manager focus on performing the following functions:

- Establishing the priority of cases and managing case assignments.

- Tracking the status of each case submitted to the Biology Section.

- Reviewing all information, including submissions forms and investigative reports, related to cases submitted to the Crime Lab with the assigned analysts in order to develop a forensic case strategy to ensure that all forensic evidence (including reference standards) is obtained by the Lab and fully exploited.

---

363 Due to the technical limitations of the OLO reporting system currently used by HPD and the Crime Lab, DNA analysts are not able to include an allelic table with the report entered into OLO. However, we are advised that an allelic table (sometimes handwritten) is included with a hard copy of the DNA reports distributed to investigators. The Crime Lab and HPD must assure that these allelic tables are provided to all users of the Crime Lab's DNA reports.

- Coordinating interactions among Biology Section analysts, investigators, and prosecutors.
- Assisting analysts in obtaining information and reference standards from investigators.
- Reviewing the results obtained by DNA analysts to determine whether additional testing of available evidence samples should be performed in order to develop potentially probative information.

3. Validation Studies

We have the following recommendations for the Crime Lab regarding further validation work that the Biology Section should perform in order to support refinements to the Section's instrumentation and procedures:

- Staff members performing validation studies should prepare an experiment plan and a final analytical report, both of which should be reviewed and approved by the Biology Section's technical leader, the outside consultant that we recommend be retained, and the Crime Lab's QA/QC Manager.
- The Biology Section should perform an extensive validation study to assess whether any changes to the DNA analysis software's current stutter filter settings would be appropriate at each locus tested.
- Additional validation experiments should be conducted on the various DNA extraction methods used by the Biology Section to ascertain the optimal extraction method for common sample types submitted to the Crime Lab for analysis.

4. Training

Personnel in the Biology Section enjoy a great deal more training, both in-house and through external programs, than analysts in the historical DNA Section ever received. We recommend that the Biology Section's training program include focused training in statistics, including the principles underlying random match probabilities, the calculation of frequency estimates, and the presentation of statistical data in laboratory reports and during testimony. We also recommend that the Biology Section

staff receive focused training on forensic serology techniques, including screening for semen and identification of spermatozoa.[364]

5. Refinement of the Biology Section's SOPs

The Crime Lab has devoted significant attention to revising the Biology Section and DNA SOPs, and they are dramatically improved over the SOPs used by the historical DNA/Serology Section. However, we observed several technical issues with regard to the SOPs used by the Biology Section. We have the following recommendations to improve and refine these SOPs:

- The SOPs should include separate forms for administrative and technical reviews.
- The SOPs should include testing procedures to characterize possible saliva stains.
- The SOPs should specify an exact target amount of input DNA for the amplification reaction (e.g., 1 ng of DNA), as opposed to allowing for a broad range of input DNA, which may result in unnecessarily low rfu values or missing loci.[365] Also, the SOPs should include an automated method to calculate the appropriate dilutions used to obtain the exact amount of target DNA needed for amplification.
- The SOPs should be expanded to contain more detailed information and guidance regarding the use and calculation of frequency estimates.

III. The Trace Evidence Section

During our investigation, the Crime Lab gradually rebuilt its Trace Evidence Section operations. The Trace Evidence Section is overseen by the same Criminalist Manager who is the technical leader and head of the Biology Section. Two Criminalists are now assigned to the Trace Evidence Section. The first examiner began training in

---

364 In 2003, the Crime Lab invited a renowned serology expert to provide training to the Crime Lab's serology staff. There has been a great deal of turnover and new hiring within the Biology Section since then. We recommend that this same expert be invited to provide serology training to the Biology Section's current staff.

365 In some cases, it is not possible to obtain the target amount of input DNA due to degradation or sample quality. However, a standard target concentration of input DNA would help ensure that each analyst consistently uses an amount of DNA that is likely to produce clear and interpretable DNA profile results.

trace evidence examination at HPD in August 2005, and she passed competency tests for hair and paint examinations in the spring of 2006. She successfully completed paint and fracture match proficiency tests in early 2006. The Crime Lab's second trace evidence examiner transferred from CER in February 2006 to begin training in trace evidence analysis. The second examiner will not begin performing casework until she has completed her training and passed the required competency tests.

Because the Crime Lab did not perform trace evidence examinations between 2003 and late 2006, it faced a difficult dilemma similar to that experienced by the reformed Biology Section: The Trace Evidence Section had to be accredited in order to resume casework that would be admissible in state criminal proceedings,[366] but it could not obtain ASCLD/LAB accreditation without a body of cases for review by inspectors.

To resolve this dilemma, in November 2006 the Crime Lab obtained provisional accreditation for trace evidence examinations from the Texas DPS.[367] The one-year accreditation, granted in November 2006, permits the Trace Evidence Section to move forward with efforts to obtain ASCLD/LAB accreditation.[368] ASCLD/LAB inspectors audited the Crime Lab's current trace evidence operation in March 2007g.

A. Technical Reviews of Trace Evidence Cases

Because there currently is only one qualified trace evidence examiner in the Section, technical reviews of trace evidence casework currently are performed by an outside examiner, Skip Palenik of Microtrace LLC, who is located in Illinois. Crime Lab managers estimate that it will take between six months and a year for the second trace evidence examiner to complete the training necessary to qualify to perform casework. Because the SOPs permit any qualified examiner to perform technical reviews, once the second examiner is qualified, it is the Crime Lab's intention that the two examiners will perform technical reviews of each other's cases. Although, upon completion of training and qualification, both examiners will have met the basic qualifications for such examinations as hair comparisons, they are both new and inexperienced examiners.

---

366 Article 38.35 of the Texas Code of Criminal Procedure states that, with limited exceptions, a forensic analysis of physical evidence and expert testimony relating to the evidence are not admissible in a criminal action if, at the time of the analysis, the crime laboratory conducting the analysis was not accredited by DPS. A provisional accreditation issued by DPS and in effect at the time of the analysis serves as prima facie evidence that the laboratory was accredited.

367 The DPS provisional accreditation was granted under authority conferred on the DPS Director in the Texas Administrative Code. *See* 37 Tex. Admin. Code § 28.139 (2005).

368 The term of the Trace Evidence Section's DPS accreditation is from October 30, 2006 to October 30, 2007.

B. The Trace Evidence Section's SOPs

The Section's training manual and SOPs are very brief and do not contain detailed procedures for the types of examinations described therein. Some of the SOPs require the reader to cross-reference the training manual to determine which specific procedures should be performed. The SOPs should function as a stand-alone resource, and not require constant cross-reference to the training manual.

We observed several items in the SOPs that merit revision. The current SOPs permit the collection of known hair samples for up to five years after the shedding of questioned hair(s). Because the characteristics of hair can change dramatically after approximately six to nine months, the SOPs should be revised to reflect a six-to-nine-month outer limit on the collection of known samples. Additionally, only equipment that is actually available and used in the Crime Lab should be referenced in the SOPs.

C. The Current Trace Evidence Work Load

Most of the forensic examinations performed by the lone qualified trace evidence examiner to date have involved hair examinations and firearm serial number restorations. Serial number restorations traditionally were performed by the Firearms Section of the Crime Lab, but these cases recently were assigned to the Trace Evidence Section to help reduce the backlog in the Firearms Section and to attempt to balance the distribution of work in the Crime Lab. It appears that the backlog of restoration cases has been resolved, and the Trace Evidence Section currently performs only a few restorations during any given three-month period. We understand that the Crime Lab is also considering moving some gunshot residue analysis (muzzle-to-target distance) from the Firearms Section to the Trace Evidence Section.

The qualified trace examiner began working on paint cases during the second quarter of 2006, but she has had few opportunities to perform such examinations since then. Indeed, she has only examined three such cases. As of April 2007, she had not yet been asked to perform any fracture match analyses.

Crime Lab personnel acknowledge that the Trace Evidence Section is not yet operating at full capacity. They attribute this, in part, to a lack of investigator awareness of currently available services. The Crime Lab reports that efforts are underway to instruct investigators about identifying trace evidence that can be collected and submitted for examination. For example, Ms. Rios reports that she has been meeting with investigators in the Accidents Division for this purpose.

However, the findings of our case review and our review of current operations suggest a persistent lack of communication and follow-up with investigators. Trace

Evidence Section personnel report that most of the 50 hair samples submitted for examination since the Section re-opened have not included a reference standard to be used to perform comparisons with hair evidence samples. We saw no evidence that examiners make any effort to contact individual investigators to request that they obtain known hair standards to compare with the crime scene hairs in these situations. Instead, investigators are merely encouraged during training sessions to obtain known standards whenever possible.

D. Plans for Future Trace Evidence Operations

There are no current plans to expand the types of examinations performed by the Trace Evidence Section to include, for example, fiber or glass examinations. Most of the work currently done in the Trace Evidence Section involves physical examination and microscopic comparison of hair samples, a technique viewed by some forensic experts as becoming obsolete, except as a screening method to determine if DNA analysis should be attempted.

Crime Lab personnel readily acknowledge that this type of hair examination is less definitive than nuclear or mitochondrial DNA analysis and report that DNA analysis will be attempted in cases with any significant hair matches. However, they do not believe (and we concur) that the current level of demand justifies the training, resources, and expense that would be required to implement in-house mitochondrial DNA analysis capability in the Crime Lab.

E. Recommendations

The key finding in our historical case review of the Trace Evidence Section was that, for reasons enumerated above, HPD was not receiving the full potential benefit of trace evidence examinations. Our review of current operations indicates that this is still true. Because of the relatively low utilization of the Trace Evidence Section, the limited range of examinations currently performed, and the lack of results from the hair examinations performed to date, we believe that much more can and should be done by the Section and by investigators to make better use of the existing trace evidence resources. As is discussed in greater detail below, we also believe that expanding the range of examinations performed could yield more information of evidentiary significance.

1. Follow-Up With Investigators

Affirmative steps should be taken by examiners to contact investigators to request known or elimination samples whenever possible. For example, if no known or elimination hair samples were provided by an officer submitting hair evidence, an

examiner should promptly contact the officer to see if collection is feasible. If the examiner receives no response from the officer, a tickler system should be created to follow up with the officer in approximately one month. If there is still no response or the officer indicates that no known or elimination samples are available, the examiner should then document the steps taken and close the file, with the understanding that the samples already collected remain available in the event future examination is required.

By increasing the likelihood of meaningful review and productive results, such steps can lead to more scrupulous evidence collection by investigators and increased utilization of the trace evidence resources being developed by the Crime Lab.

2. Expand Available Services

Disagreement exists in the forensic community regarding the utility of microscopic hair comparisons in light of existing DNA technologies. Although some forensic experts continue to find significant value in microscopic hair comparisons, we believe the Crime Lab should begin focusing some of its efforts on other types of trace evidence examinations.

For example, an increased emphasis on the collection and examination of fibers could yield valuable evidence in a wide range of cases. Many forensic laboratories perform fiber examinations in the same unit that performs hair comparisons (sometimes referred to as the "Microscopy Unit"). Much of the equipment required and some of the methods used are similar, and, with additional training, inclusion of fiber examinations would be very beneficial to the Crime Lab and to HPD.

Shifting some of the focus from hair examinations to paint and glass analyses would enable the Section to provide valuable services in burglaries and in motor vehicle accidents, including hit-and-run cases. We recognize that the equipment for performing certain types of examinations (e.g., soil examinations) and the training required can be expensive and may not, at least initially, provide an appropriate return on investment. Another concern is that the lack of past demand for certain types of examinations means that analysts will have difficulty maintaining proficiency to perform examinations that are in low demand. For such cases, an SOP should be developed to describe the procedure for outsourcing the examinations.

3. Reconsider Technical Review Plans

For the foreseeable future, the Trace Evidence Section should continue to outsource the technical reviews of its cases to a highly qualified outside expert, even after the second examiner is qualified. Both of the Crime Lab's current trace examiners

are newly trained and inexperienced as fully qualified trace evidence examiners.[369] These examiners cannot be expected to perform high level technical reviews at this stage, and they would not be able to provide each other with the technical guidance and mentoring that they should each receive as they continue to develop as trace evidence experts.

4. Revisions to the Trace Evidence SOPs

Trace evidence SOPs should be revised and expanded so that they function as a stand-alone resource and do not require reference to other manuals. The SOPs should be revised to include specific examples of good reporting language. Such model language would help examiners identify descriptive terms that better communicate to investigators and prosecutors the significance of a particular finding. The Crime Lab should also ensure that equipment required to perform specific examinations referenced in the SOPs is actually available in the Lab.

Because the characteristics of hair can change dramatically after approximately six to nine months, SOPs should be revised to reflect a six-to-nine-month (if possible) outer limit for the collection of known samples, rather than the current five-year standard.

5. Restore Firearms-Related Services to the Firearms Section

Serial number restorations and gunshot residue (muzzle-to-target distance) testing should be performed by Firearms Section examiners, as was traditionally done in the Crime Lab. Performing serial number restorations in the Firearms Section reduces unnecessary handoffs and transportation of firearms between sections. If equipment, space, and personnel in the Firearms Section are inadequate for this task, the Crime Lab should make the necessary physical improvements and additions to that Section's facility and staff as soon as possible. The expertise required for trace evidence and firearms examinations differs, and the two sections are better served if examiners focus on maintaining proficiency in their own areas of expertise. Although chemicals are used for both serial number restorations and gunshot residue examinations, it is not necessary to have a chemistry background to perform these examinations.

---

369 One of the current trace evidence examiners has prior experience as a laboratory assistant with the Georgia Bureau of Investigation, where she assisted with the examination of trace evidence.

IV. The Controlled Substances Section

After completing our review of cases worked by the Controlled Substances Section from 1998 to 2004, we turned our attention to the Section's current operations to assess the quality of work being performed by the Section and to determine whether issues noted in our previous reports have been addressed.

Our review of current case files from 2005 and 2006 revealed that the Controlled Substances Section has made significant progress in correcting issues identified in our historical review. Overall, we found that the work being performed by this Section is of high quality. Moreover, the Section now has SOPs that are clear and organized, in contrast to the multiple documents, manuals, and oral instructions analysts previously relied on to determine the operating procedures in place. Additionally, we found that analysts are adhering to the established requirements of the SOPs.

Analysts are also maintaining well-documented case files. For example, in current case files, analysts had worksheets and instrument printouts that were completed accurately and in accordance with the SOPs. Other previously identified documentation issues, such as the absence of records regarding sample preparations, reagents, and blank runs, as well as the lack of initials reflecting who made changes in a case file, were no longer common in the recent cases we reviewed. Analysts are also ensuring that both the amended report and the original report are maintained in the case files when amendments are made.[370] These improvements address many of the problems identified as minor issues in our review of cases from 1998-2004.

Additionally, the Section has rectified the two problems that led us to identify major issues in over 100 of the cases in our historical review. First, analysts now take the following steps when identifying most pharmaceuticals:

- a pharmaceutical identification (i.e., an identification based on labels or markings, not on chemical analysis) is performed for most liquids, tablets, and capsules;
- analytical screening tests are performed if necessary; and
- one confirmatory test, either a GC/MS or an FTIR, must be performed.

---

370 This practice of maintaining reports in the lab file is necessary, but does not change the fact that HPD's OLO system hinders the Crime Lab's reporting process.

By taking these steps, an analyst will have made a definitive identification of the substance based on confirmatory analytical testing. If for some reason a pharmaceutical is not analytically tested and only pharmaceutically identified, the SOPs requires analysts to indicate that with the following wording: "Pharmaceutical identification only. No chemical analysis performed."[371]

The revised SOPs also address the second type of pervasive major issue identified in our historical review: the Section's practice of reporting quantitative results for liquids and tablets when quantitative analyses were not performed. The current SOPs state that, when the quantity of the controlled substance determines which penalty group applies under the Texas Controlled Substances Act, an analyst may determine the quantity of a controlled substance either by accepted analytical quantitative procedures or by available pharmaceutical information. However, Controlled Substances Section SOPs now require that the wording of the report must clearly indicate when an item's quantitation was determined from pharmaceutical information rather than analytical quantitative testing.

A. Methodology of the Review of the Controlled Substances Section's Current Operations

To assess the Section's current operations, we reviewed a total of 81 cases completed during 2005 and 2006. One of our case samples, totaling 52 cases, was made up of the basic marijuana and cocaine identification cases that represent the majority of cases handled by the Section. The second sample of 29 case files focused on tablet, capsule, and liquid cases.

B. Assessment of the Controlled Substances Section's Casework

Overall, we found that the work currently being performed by the analysts is of high quality. The analytical testing procedures were well documented in the case files, which made our review easier to complete, and those procedures were also performed in adherence with the Crime Lab's updated SOPs.

However, in a case in which the identification of codeine was reported correctly, we have concerns regarding the manner in which the analyst interpreted the other testing results. In the GC/MS printout located in the case file, the total ion chromatogram showed three principal peaks. The analyst seemingly correctly

---

371 We note, however, that we did not review any cases where an analyst used this statement because, in all of the reported cases we reviewed, analysts had fully analyzed the substances.

identified the first peak as promethazine and the second peak as codeine, but then identified the third peak as also being promethazine.

It is difficult to understand how a single injection of evidence sample analyzed by the GC/MS could have resulted in two different peaks being identified as the same compound, especially because:

- the reference standard produced only one peak;
- two other Controlled Substances Section case samples involving a mixture of promethazine and codeine showed no secondary promethazine peak; and
- one of those case samples involving a mixture of promethazine and codeine was analyzed using the same instrument used in the case we reviewed.

Therefore, the result reported by the analyst is an unlikely one, and we would have expected that, prior to issuing a report, the analyst would have conducted -- and the supervisor would have required -- repeat testing using a new sample from the submitted liquid to see if the same results were obtained.

It is our understanding from speaking with the Section's supervisor that analysts have produced these rather odd results on occasion in the recent past and that the Section believes these results can be attributed to the fact that the codeine syrup was not pure but, rather, was mixed with soda or juice. The Section believes that somehow the soda or juice mixed with the codeine syrup caused the abnormal results on the TIC.

While this theory may be correct, the Section should determine why analysts are returning odd results. For example, it should conduct validation testing or discuss the issue with other laboratories that may have encountered the same types of abnormalities. The Section should do this in a way such that results can be properly verified. Analysts must provide solid and scientific explanations for all of their results, which they can then use if they are called to testify about their testing, results, and interpretation of such results. We discussed these suggestions with the Controlled Substances Section leader, and he was welcoming of them.

The second questionable test result we identified involved a substance that we understand is rarely encountered in the Controlled Substances Section. In the case we reviewed, an analyst reported an identification of dextropropoxyphene using a combination of the results of a GC/MS analysis and the results of a pharmaceutical reference identification. However, GC/MS can only confirm the presence of propoxyphene, a non-controlled substance, and not its isomers including dextropropoxyphene, which is a controlled substance.

Furthermore, the analyst's second source of information, the pharmaceutical reference material, was also insufficient to support the conclusion that the substance was the "dextro" isomer. As the case file stands, the analyst reported a finding unsupported by chemical analysis.[372] Further testing, such as a microcrystalline test, should have been performed to substantiate the identification of dextropropoxyphene.[373]

1. Drug Standard Retention Times

We developed some concerns about the retention times of drug standards, which are recorded by analysts and used as the basis of comparison when interpreting the GC portion of the GC/MS runs. In general, GC is used to separate mixtures of substances into individual substances. Once separated, the substances can be evaluated individually, and one aspect of evaluation is the amount of time that a substance is retained in the GC column, which is known as the retention time. Every time the same substance is analyzed by the same GC, the retention time should be the same, as long as the experiment conditions, such as the column temperature and gas flow within the GC/MS instrument, have not changed. The Crime Lab runs a mixture of standards of the drugs most commonly analyzed, such as a mixture of known samples of cocaine and heroin, through each GC/MS instrument daily to verify the retention times for each drug within each instrument. A master list of those retention times for the standards is maintained for each GC/MS instrument in the Crime Lab. The analysts can then compare the retention times of unknown substances run within the same instrument that day to the retention times listed on the master list of known substances.

The Section conducts this verification daily because retention times could change from one day to the next if the conditions within the GC/MS instrument change even slightly. The Controlled Substances Section's practice of using this master list is satisfactory since it is combined with the practice of routinely updating the retention times for more commonly analyzed drugs.

However, the Controlled Substances Section verifies the retention times of less frequently encountered drugs much less regularly. Reference standards should be analyzed with the same instrument and under the same conditions as the unknown

---

372 Because this analysis was performed in connection with an active investigation, we were not permitted to review the OLO case file. However, HPD representatives informed us that the controlled substances analysis is not likely to be material to the investigation because the suspect is being investigated for the crimes of robbery, assault, and murder.

373 This is required in the Controlled Substances Section's reference material pertaining to dangerous drugs.

evidence sample. Therefore, when testing for less frequently encountered drugs, generally accepted forensic science principles require that the Section ensure that analysts run reference standards within the same timeframe as the unknown evidence sample of the less commonly encountered drug. The analysts should retain a copy of the standard run within the case file for documentation purposes.

2. Technical Reviews

In the recent cases we reviewed, both administrative and technical reviews were performed on all controlled substances cases. However, while the current SOPs require that administrative reviews be performed prior to the issuance of reports, the SOPs only recommend, rather than require, that technical reviews be completed prior to the report's issuance. During our review of the 2005 and 2006 cases, we identified several case files in which technical reviews occurred weeks or months after the analyses were completed and the reports were issued.

Because a technical review is completed for the purpose of confirming the accuracy of the analysis, the timeliness of the review is critical. Good forensic practice dictates that the technical review be completed before dissemination of the report so that any errors in the analysis or reporting can be corrected. It is crucial that technical reviews of controlled substances cases be performed promptly because Crime Lab analysts often process cases when they become high priority after a court date is established. This makes it more likely that an analyst's report could be used to garner a guilty plea or a conviction before it is ever technically reviewed.[374]

3. Documentation

While there have been vast improvements in documentation, a few issues discussed in previous reports are still unresolved. The first involves the tracking of evidence in controlled substances cases with more than one item of evidence. At times, we found it quite difficult to determine how the items described in the police officer's submission form correlated with the items examined by the analysts and with the items in the lab report. Item designations appeared only on the worksheets and analytical documentation, and the designations varied from analyst to analyst. Generally

---

374 The following wording found on all reports from the Controlled Substances Section is disconcerting: "Laboratory policy requires that reports of analytical results undergo a technical review by a second qualified analyst." We are concerned that this language gives the impression that a technical review has already been performed, even though technical reviews are often actually being completed after the report's issuance.

accepted forensic science principles are to assign a unique identifier to each item of evidence and then to use that identifier throughout the course of the investigation.

A second documentation issue involves analysts routinely modifying the submitting officer's description of evidence in the Property Record by adding to, deleting from, or completely altering the original description given on the submission form. All of these practices are inconsistent with generally accepted forensic science principles. For example, if an officer's submission form has recorded that an envelope submitted to the Crime Lab holds twenty tablets and the Lab personnel count only 19 tablets, Lab personnel make corrections on the officer's submission form. This practice is inconsistent with generally accepted forensic science principles and problematic for two reasons. First, it does not explain why the description was changed. Second, it could allow security concerns about misplaced or missing controlled substances to go unnoticed.

4. Retention of Evidence

An issue first identified in our historical review that still persists under current operations is that analysts continue to retain evidence for long periods of time after their work is completed. We noted that this practice occurs less frequently than it did during our historical case review, but it continues to have potential security implications and increases the risk of theft or loss of evidence.

5. Case Turnaround Time and Backlogs

Most of the cases we reviewed, historical and current, had lengthy turnaround times. In our review of current operations, the period between submission of evidence to the Crime Lab and the issuance of a report was approximately eight weeks in 2005 and approximately three and a half weeks in 2006. It is possible that the turnaround time improved in 2006 because additional analysts joined the Section and the Section began to limit its work to cases with assigned court dates. However, the Section still has a large backlog of older cases that the Crime Lab needs to address.

Our understanding is that, even if an analyst is able to complete the allotted number of cases by noon on any given day, that analyst is not assigned more cases to work until the next day. With controlled substances analysis, the time it takes to complete cases varies, depending on the number of exhibits associated with a case and the analyses that have to be performed to make a definitive identification of a substance. Because some cases can be analyzed rather quickly, it is often possible to complete eight cases within a period of a few hours.

6. Supervision

There currently is only one supervisor in the Controlled Substances Section, who is the Criminalist Manager over both the Controlled Substances and Toxicology Sections. While there is a Criminalist Specialist position designated for the Controlled Substances Section, that position currently is vacant. The lone supervisor in the Controlled Substances Section does not have enough time to properly supervise all the analysts in the Section, review technical issues related to the Section's casework, and perform his other administrative duties. Also, because several of the Controlled Substances analysts are new to the Crime Lab, they require significant individualized supervision and mentoring, which is difficult for a single supervisor to provide.

C. Recommendations

The Controlled Substances Section is to be commended for generally performing high quality work and for making many changes that have addressed a number of the issues we identified in previous reports. We strongly recommend that the Section implement the following recommendations and that the Section continually evaluate its own procedures, practices, and work product to ensure that the quality of its work is maintained and improved as the Crime Lab grows.

1. Technical Reviews

The Controlled Substances Section has considered instituting a system in which two analysts spend one day per week performing technical reviews; however, we believe the Crime Lab would benefit from a more rigorous standard for accomplishing technical reviews. Therefore, we recommend that the Crime Lab change its policy and practices so that technical reviews occur no later than two days after the analysis is completed and prior to the issuance of an oral or written report.

We understand that the Controlled Substances Section is instituting an additional review system whereby randomly selected cases will receive a secondary review, above and beyond the already required administrative and technical reviews.[375] A secondary review can benefit the quality assurance system of the Lab, but it would lose much of that beneficial effect if not performed in a timely manner (e.g., if it occurs well after a case's legal disposition is likely to have been determined). Therefore, we recommend that any secondary reviews done in the Section be conducted in a timely fashion.

---

375 The secondary review is not currently part of the Crime Laboratory Division Quality and Operations Manual or SOPs.

Timing is important for the technical review process, but *who* performs the reviews is also significant. We recommend that the Controlled Substances Section allow all analysts to perform administrative reviews of other analysts' reports. However, the technical review process and any secondary review process should be limited to the most experienced analysts and supervisors in the Section.

2. Supervision

In order to assure that analysts receive the proper amount of supervision, the Crime Lab managers should evaluate the duties assigned to section supervisors. It appears that the one supervisor currently in the Controlled Substances Section does not have enough time to properly supervise all the analysts in the Section and also perform his other duties. We recommend that no single supervisor in this Section be responsible for overseeing the work of more than ten analysts. The Crime Lab should take the necessary steps to fill the vacant Criminalist Specialist position and hire at least one additional experienced supervisor for the Controlled Substances Section.[376] If these new hires are made, we recommend that one new supervisor be hired from outside of the Crime Lab in order to bring a fresh perspective to the Section.

We also recommend that the Controlled Substances Section establish another tier in its hierarchy of analysts in order to distinguish less experienced analysts from more experienced analysts who are capable of handling certain supervisory tasks, such as training and conducting technical reviews. Adding this additional tier of more experienced analysts should also help to free up time for the highest level of supervisors, who could then focus on developing and reviewing policies and procedures as well as ensuring that the Section is maintaining the quality of its work.

3. Documentation

To reduce the difficulty that currently exists when correlating items listed on an officer's submission form with the items examined by analysts and listed on the lab report, we recommend that a consistent item designation system be developed and that the unique item identifiers be documented on the Section's submission forms, worksheets, analytical testing documents, and supplemental reports. We believe this will assist not only analysts and technical reviewers but also investigators, prosecutors, and defense attorneys.

---

376 As discussed in the historical section of this report, the Controlled Substances Section traditionally was staffed with three Criminalist III supervisors. This level of supervision contributed to the Crime Lab's ability to detect the drylabbing incidents involving Mr. Price and Mr. Patel.

Additionally, we recommend that the Section's SOPs be modified so that descriptions of any discrepancies between information on the evidence submission form and the evidence actually submitted are documented on the analysts' worksheets rather than on the submission forms. In addition, we also suggest that any discrepancies be brought to the attention of both a Controlled Substances Section supervisor and an HPD Narcotics supervisor, each of whom would also document the discrepancies. The supervisors would then have the information needed to identify any problematic patterns indicating that evidence is being lost or stolen instead of just being accidentally miscounted or inaccurately recorded.[377]

4. Security

Any lab dealing with large amounts of controlled substances has to take precautions to ensure that those substances are not being misappropriated. Therefore, the Crime Lab needs to evaluate how best to prevent security problems, and it should consider taking some or all of the following measures to help deter the improper use or theft of controlled substances:

- implementing a procedure where random sampling tests are used to determine whether a stored controlled substance has been replaced or diluted, indicating that a portion has been stolen and replaced with a filler substance;[378]
- installing electronic devices to track those entering and exiting rooms holding controlled substances;
- putting in place a random urine testing program for employees; and
- implementing a blind testing program in which known, non-evidentiary samples are submitted to CER for analysis by the Controlled Substances Section as if they were evidence related to an investigation in order to evaluate the Crime Lab's

---

377 By instituting a policy where the submitting officer's supervisor receives notification of a discrepancy and then documents the issue, the officer will be able to use that information if called to testify. Additionally, the notification of HPD supervisors may encourage officers to more carefully document future submissions.

378 In implementing this procedure, a small sample would be taken before the analyst begins testing the substance; then, at a later date, testing of the stored controlled substance could be compared to testing of that small sample. This security procedure has the added benefit of serving as a quality assurance tool because the re-testing of the substance could be used to verify the analyst's original testing.

processes for handling evidence as well as the proficiency and integrity of the Lab's controlled substances staff.[379]

5. Retention of Evidence

We recommend that a requirement be established that, absent a well-documented reason, evidence must be returned within one week after the analyst has completed testing. Additionally, the time between retrieval of evidence by an analyst and the analyst's return of the evidence should be less than one month.[380]

6. Retention Times for Standards

As discussed above, we learned during our review of current operations that the standard retention times of less commonly encountered drugs are not regularly obtained for each GC/MS instrument in the laboratory. We recommend that the Section ensure that:

- the retention times for drug standards should be verified more frequently and updated on the master list; and
- for drugs encountered less frequently in the Crime Lab, analysts should run the standards within the same timeframe that the evidence sample is tested, and a copy of the standard run should be retained in the case file.

7. Case Turnaround Times and Backlog

We recommend that the Controlled Substances Section change its current procedure under which analysts are assigned a specific number of cases (usually six to eight) per day. Analysts should be able and encouraged to work more cases whenever it is practical to do so. Additionally, to encourage analysts to complete a greater

---

379 In implementing a blind testing program, we would recommend that the Crime Lab's QA/QC Manager work with a designated HPD Narcotics Division supervisor to ensure that each analyst receives at least one blind test per year. While the supervisor and members of the Controlled Substances Section should be aware of the blind testing program, they should not be advised of the tests in advance or even be aware of the number of tests provided during any given time period. The tests should include both controlled and non-controlled substances. In addition to testing security and integrity in the Controlled Substances Section, these blind tests will also serve to test the competency of the analysts and supervisors.

380 To ensure that analysts are not in possession of evidence for longer than a month, we recommend that CER conduct a regular inventory of both the evidence it is storing and the evidence currently in the possession of analysts.

number of cases, the Lab could establish a yearly case expectation number. The quantity of cases that an analyst works per year, along with the quality of the work done by the analyst, could be considered in an annual performance evaluation.

While backlogs are a common problem suffered by many forensic laboratories, we recommend that the Section develop a plan to reduce its turnaround times and backlog. One suggestion would be for the Crime Lab to eliminate from its backlog older cases that either have already been adjudicated or will never go to court, such as found property and no-suspect cases. The Crime Lab should also seek to establish a policy regarding this issue so that these cases are automatically culled out and do not become a part of any future backlog.[381] Finally, we suggest that the Crime Lab seek guidance from other drug labs concerning backlog reduction methods.

V. The Firearms Section

As discussed above, our review of the Firearms Section cases analyzed during the 1998-2004 period found that it performed reliable and, in some cases, very high quality work. In connection with our review of the Crime Lab's current operations, we reviewed 30 current cases examined by the Firearms Section since it received accreditation in May 2005. We found that the technical issues identified in our historical case reviews have been addressed by the Section's current SOPs. However, we identified several current operational issues that constrain the effectiveness of the Firearms Section and contribute to the growing backlog of cases that currently exists in that Section.

A. Backlogs and Caseload

The Firearms Section currently is experiencing a backlog of over 600 cases, and the increased case submission rate that the Section is experiencing is expected to continue. The backlog of entries into the IBIS system[382] is over 200, although a grant-funded position recently awarded to the Firearms Section is expected to help alleviate this smaller backlog in the short term.

---

381 In addition to eliminating these types of cases from the Section's backlog, the Crime Lab also needs to secure authorization to destroy such evidence so that it is not using its space and resources to store tons of substances that will never need to be analyzed.

382 "IBIS" is an "Integrated Ballistics Imaging System." As the name suggests, it is a computerized system that, among other things, captures, stores, and analyzes images of bullets and cartridge casings.

The Firearms Section currently is staffed by a Criminalist Manager, two Criminalist Specialists, and two Criminalists. Four of these examiners are now available for full-time casework in the Firearms Section. This total may decrease in the near future, however, because two of the Section's current senior examiners are approaching retirement age.

There are currently two vacant firearms examiner positions allocated to the Section. If these positions are not filled with experienced examiners, the training of the new examiners could take over a year. In the meantime, training the new hires will put further pressure on the Firearms Section. HPD has advised us that the use of outside training for new examiners has been considered, but the cost and limited availability of such alternatives may leave in-house training as the only option. The training time required for new hires makes addressing the backlog extremely difficult and, in fact, will likely further increase the backlog in the near term.

Difficulty in retaining experienced examiners places another strain on staffing in the Firearms Section. The former head of the Firearms Section recently left HPD to work in the Harris County firearms laboratory, where we are told he receives a higher salary to do the same work. Experienced firearms examiners are in high demand in crime laboratories across the country and generally are able to command higher salaries than forensic scientists in other disciplines. This competitive market for experienced firearms examiners will make it difficult for the Crime Lab to recruit and retain the number of examiners it needs to address the volume of firearms cases submitted to the Section and to provide the full array of services that HPD requires.

Professional development opportunities for the current Firearms Section staff are limited due to their workload constraints. The Firearms Section should be adequately staffed to permit its examiners to process cases in a timely manner, to regularly attend professional meetings, to give presentations, to contribute to articles to forensic science publications, and to carry out case-related research. Over the long run, these activities are crucial to the professionalism, reputation, and continued high quality work of the Firearms Section.

B. Inefficient Use of Examiner Time

Firearms examiners receive some of their evidence directly from submitting officers, while they receive other evidence via lock boxes that they must clear on a daily basis. Although direct submissions allow face-to-face contact between examiners and investigators, these activities interrupt evidence examinations as examiners must stop what they are doing to retrieve and/or sign-in evidence. The examiners also reported to us that an inordinate amount of time is currently being spent answering telephones,

searching for evidence, and searching for case files. This is time that would be better spent on evidence examination.

C. Facilities Issues

We reviewed the Firearms Section facility and interviewed each of the individual examiners who work in the Section. While the examiners make good use of the space they currently have, we noted some shortcomings in the facility design and the materials and equipment available to the examiners. Some of these shortcomings are significant, but most can be remedied fairly expeditiously.

1. Inadequate Reference Collection

The Firearms Section does not have an adequate collection of reference materials, including reference firearms and ammunition. This is surprising because Houston is one of the largest cities in the country, and there is no shortage of firearms in the region.[383] In addition to collections of different firearms, this resource should also include an adequate ammunition reference collection, consisting of disassembled ammunition components. HPD examiners told us that they sometimes experience difficulty obtaining weapons for reference purposes, and, even when such weapons are available, the Section does not have an adequate storage facility for them.[384]

2. Inefficient Work Space

The layout of the existing facility does not lend itself to good work flow. Of particular concern is the large area for comparison microscopy that is situated in the main traffic flow area of the Firearms Section. The inevitable distractions from the time-consuming and intense work involved in comparison microscopy caused by its being located in a high-traffic area of the Section make adequate concentration nearly impossible. In an effort to screen out distractions, examiners state that they frequently resort to wearing headphones. The IBIS work area, on the other hand, is maintained in a separate cubicle away from high traffic and other distractions, even though this type of work is relatively less intensive.

---

383 The firearms sections in the laboratories of the Chicago, Los Angeles, and New York City Police Departments all have substantial firearms reference collections that are essential to examiners for training, research, and casework.

384 The Firearms Section's written reference library is also inadequate and disorganized, reflecting both budgetary constraints and staffing issues. There is no existing routing mechanism for the review of new reference materials as they arrive in the Crime Lab.

3. Inadequate Cleaning Facilities

According to examiners, bloody weapons and ammunition components are frequently submitted to the Firearms Section. Examiners have a single small sink that was installed after they made numerous complaints regarding the lack of adequate facilities for cleaning bloody evidence. This current sink, which is inadequate, is a plastic half-sink rather than the full-size stainless steel version with a countertop that is needed for the tasks performed in the Firearms Section. We also observed blood splatter on the walls near the sink that resulted during the washing of evidence.

D. Recommendations

Based on our review of the current operations of the Firearms Section, we have the following recommendations.

1. Technical and Administrative Reviews

The Section should develop and use separate checklists for technical and administrative reviews to ensure that the reviews are uniform and thorough. The technical and administrative review forms should require the reviewers to confirm that each step in the review process has been performed.[385]

2. Caseload and Backlog

We have the following recommendations to help the Firearms Section address its current backlog of cases.

- The Firearms Section should consider contracting with retired examiners to assist with casework.
- Retired examiners could also help train the new firearms examiners in-house at HPD in order to allow current firearms examiners to concentrate on casework.

---

385 The Firearms Section's SOPs contain lists of items to be covered during technical and administrative reviews. *See* Firearms Section SOPs at FTM-QA-1. Our recommendation is that the Crime Lab create separate forms for administrative and technical reviews that list each of the relevant areas to be covered by the reviews, as described in the SOPs, and that reviewers check off each of the items and include the forms in the case file. Such forms for technical and administrative reviews are used, for example, by the Crime Lab's Biology Section (although, as discussed above, we have recommendations for improvement of the Biology Section's current review forms).

- HPD also should explore coordinating the training of new firearms examiners through partnerships with Harris County, the DPS, and the Pasadena (Texas) Police Department.

- The Firearms Section should also continue exploring the possibility of sending some cases to the DPS, the FBI, and the Bureau of Alcohol, Tobacco, Firearms and Explosives ("ATF") until the backlog is substantially reduced.[386]

- HPD, in coordination with the District Attorney's Office, should develop a system to assign priority to cases requiring firearms examination based on those cases that are pending in court. The system should be designed to notify the Firearms Section as soon as possible when a case requiring examination is assigned a court date.

- The Firearms Section should consider suspending the entry of information regarding revolvers into IBIS, as fired cartridge casings from these firearms have only limited information for search purposes.

- Where appropriate, the Section should restrict the examination of firearms evidence in suicide cases and minimize examinations in cases where no charges have been, or are likely to be, filed.

3. Serial Number Restoration

As is noted in the Trace Evidence Section discussion above, serial number restoration work is being handled by that Section because its workload is light relative to that of the Firearms Section. This understandable effort to maximize the efficiency of the Crime Lab is not an ideal arrangement and should be temporary. Firearms examiners are much more familiar with the nature and locations, including hidden locations, of these numbers on firearms and thus better able to perform this work.

Until the backlog is alleviated, we recommend a temporary transfer of some of the work involved in muzzle-to-target distance determinations to the Trace Evidence Section. Firearms examiners could carry out the necessary test firing into cloth test panels and send the panels to the Trace Evidence Section for subsequent Griess and sodium rhodizonate testing and other chemical development work. When the caseload

---

386 HPD reports that it has contacted outside agencies, including DPS, the FB,I and ATF, about assisting the Crime Lab with its backlog of firearms cases but that, to date, outsourcing has not proven to be a viable alternative in addressing this problem.

and facility permit, we recommend that all steps of distance determination be returned the Firearms Section.[387]

4. Inefficient Use of Examiners

The responsibilities of the current clerical person in the Section should be expanded or an additional clerk should be hired in the Firearms Section to reduce the amount of clerical work handled by examiners. For many reasons, including reasons described elsewhere in this report, all firearms evidence should be submitted to the Property Room. An evidence technician should be responsible for receiving and inventorying evidence from the Property Room and for returning evidence to the Property Room.

5. Professional Development

Providing opportunities for professional development will improve the quality of work, morale, and staff retention in the Firearms Section. Each firearms examiner should be provided sufficient time, opportunity, and funding to maintain at least one professional membership and to attend at least one professional meeting or training seminar annually.

6. Facility Improvements

We recommend that the following improvements to the Firearms Section's facility and work space:

- Acquire weapons for reference purposes and storage cabinets to contain them, although we recognize that space for such storage cabinets is a major concern. If the Property Room takes over all firearms evidence receipt and long-term evidence storage, as we recommend, adequate space could be made available in the firearms vault.

- The comparison microscopy equipment should be moved into the larger existing cubicles to maximize the use of space. Alternatively, partitions should be placed in the current microscopy area to isolate the microscopes.

---

387 The Firearms Section has only one fume hood, which is located in the front office area. There is no water available in this fume hood, and its size is unsuitable for the efficient examination of long guns. The primary need for a fume hood is to perform serial number restorations and chemical testing of gunshot residues. Once workload distribution permits the recommended return of serial number restorations and residue testing to their proper location in the Firearms Section, an adequate fume hood should be installed in a more appropriate location in the Section.

- Install a stainless steel sink of an appropriate size in the Firearms Section as soon as possible, and provide rubber aprons and gloves for washing evidence.

7. Refinements to the Current SOPs

The updated SOPs are in keeping with generally accepted forensic science laboratory principles. However, we suggest a few refinements to existing protocols.

- **Garment and Vehicle Examination Forms**. Current procedures call for the use of examination sheets with "generic" clothing diagrams ("T-shirt," "trousers," etc.) and vehicle diagrams. Better options include creating digital images of the evidence items themselves and using available software that provides more realistic choices for garment and vehicle representations. Many crime laboratories favor using digital images while also utilizing hand-drawn sketches in the notes.

- **Digital Imaging**. Photographs are routinely used by the Firearms Section to document ammunition component comparisons. Many laboratories also document serial number restorations photographically in order to create a record of what may be a transitory restoration. We also suggest expanding the use of photographic and digital imaging to include all submitted firearms evidence items, such as weapons, fired cartridge casings, and bullets; the results of gunshot residue tests; and any other appropriate test results and scene evaluations.[388]

- **Documentation of Trace Evidence Identified on Firearms Evidence**. We recommend that the SOPs include a written protocol addressing the documentation of trace evidence found on all items of evidence examined by the Firearms Section, including firearms, ammunition components, and tools. Additionally, space should be added to the worksheets to ensure that the presence of any trace evidence is recorded. This protocol should include taking digital photographs of the trace evidence in place on the firearms evidence prior to its removal.

---

[388] HPD firearms examiners use various means, including written descriptions, diagrams, and sketches, in addition to digital photographs to document evidence. While these traditional methods of documenting evidence may be adequate in many cases and are not inconsistent with general accepted forensic science principles, there are a number of advantages with digital photography -- including the resolution, detail, and accuracy of the images and the convenience of digital data -- that support our recommendation that the Crime Lab make greater use of digital imagery.

- **Physical Examination and Classification of Tools**. We recommend developing a specific worksheet to guide examiners in toolmark examinations and maintaining photographic documentation of toolmark identifications. The SOPS should also provide that casts of evidence toolmarks should be retained, as well as toolmark tests and distance test patterns.

- **Modified Griess – Direct Application Technique (DAT) Test**. The current procedures outline the use of the Modified Griess Test, as opposed to the traditional Griess Test, as a method for transferring nitrite residues in muzzle-to-target distance tests. While the traditional version was criticized years ago for its use of suspected carcinogenic chemicals, it produces superior results to the modified version. We recommend that the Section review recent literature regarding these tests and consider reverting to the traditional Griess Test. [389]

VI. The Toxicology Section

When the Crime Lab's Toxicology Section came under public scrutiny in 2003, most of the tests performed by the Section involved blood and, more commonly, urine samples collected from individuals suspected of driving under the influence of alcohol or other drugs. Quantitation was performed only for cases involving alcohol. The Toxicology Section was also responsible for calibrating and maintaining breath alcohol testing devices used by HPD officers in the field and for training officers in the use of this equipment.

The Crime Lab stopped performing toxicology analyses during the period from October 2003 to May 2005[390] after Pauline Louie, the Criminalist IV supervisor who had been running the Section since 1992, failed a competency test. At the time, Ms. Louie had many managerial duties as the supervisor of both the Toxicology and Controlled Substances Sections and frequently had to appear in court in support of the breath test program. However, because analyst attrition had left the Section understaffed, she had no choice but to resume casework analysis, even though she had not been actively

---

389 Specifically, we recommend two articles that appeared in the AFTE Journal in 2001: *An Evaluation of Various Griess and Modified Griess Test Protocols*, by James Carroll, LAPD, and *A Simplified Griess and Sodium Rhodizonate Test*, by Robert Shem, Alaska DPS.

390 The Toxicology Section continued to be responsible for calibrating and maintaining breath alcohol testing devices and for training officers in the use of this equipment, even after it stopped performing toxicology analyses. However, this service was outsourced for approximately four months in 2006, when the Section had no certified analyst available for the task. In May 2005, the Toxicology Section resumed blood and urine alcohol testing after it was granted a limited ASCLD/LAB accreditation.

doing bench work for some time. Ms. Louie was the only qualified toxicology analyst on staff at this time, which meant that there was no other person on staff qualified to provide technical reviews of her work.

A. Current Operations in the Toxicology Section

In May 2005, ASCLD/LAB granted the Toxicology Section accreditation for blood alcohol testing.[391] At the time, the only qualified analyst available to perform this testing was Joseph Chu, who was subsequently placed on administrative leave in December 2005 after the issuance of our Fifth Report.[392] From December 2005 until March 2007, blood and urine alcohol testing was performed for HPD by several different outside laboratories, including the Harris County ME's laboratory, the Texas DPS laboratory, and the Dallas County laboratory. The Toxicology Section now has an analyst who completed the necessary training on March 9, 2007 and is qualified to perform blood alcohol testing.

Analysts from the Toxicology Section continue to be responsible for calibrating and maintaining breath alcohol testing equipment used for the approximately 4,000 breath alcohol tests administered each year by HPD officers. They also train HPD officers in administering breath alcohol tests. For a brief period (between April and August 2006), the Toxicology Section lacked qualified personnel to maintain and calibrate HPD's testing equipment. During that time, the breath alcohol testing program was administered by an outside laboratory. As of April 2007, three individuals trained as breath test analysts were working in the Toxicology Section, but only one was a certified technical supervisor under the DPS-administered breath alcohol testing regulations.[393] Crime Lab personnel expect that all three Toxicology Section analysts will eventually be certified for the breath alcohol testing program.

---

391 The ASCLD/LAB accreditation states that the Crime Lab is accredited in toxicology for "blood alcohol only." However, "blood alcohol" is a term that is used expansively in the forensic toxicology context to include alcohol testing in other body fluids as well. In many labs, urine alcohol results are converted to equivalent blood alcohol results and reported as a blood alcohol concentration.

392 As discussed above in the historical sections of this report, Mr. Chu was one of the most prolific analysts in the Crime Lab's DNA Section during the 1990s and early 2000s. HPD placed Mr. Chu on administrative leave and opened IAD investigations into his conduct after cases in which he performed DNA analysis were criticized in our prior reports.

393 Breath test analysts maintain the breath test equipment and records, train officers in use of the equipment, and assist with pre-trial discovery. In court proceedings, the analyst testifies to the significance of the results of the test, while the officer testifies as to its administration. Each

Footnote continued

B. Methodology of the Review of the Toxicology Section's Current Operations

Because of the staffing circumstances described above, there was a limited universe of cases to review when we evaluated the Toxicology Section's current operations. PwC selected 30 toxicology case files from the eight-month period in 2005 when Joseph Chu was the only analyst performing blood and urine alcohol testing. Files were selected based on their assigned uniform crime reporting ("UCR") codes; UCR 21 was used to identify files involving DWI cases. Sixteen of the files in our sample involved urine alcohol testing, eight related to blood alcohol tests, and the remaining six files did not involve blood or urine specimens.[394] Drug toxicology analysis was performed by the ME's Office when needed.

No major issues were identified in our review of the 2005 blood and urine alcohol cases, and we made a number of observations that reflected favorably on the work performed:

- The case files were well organized; all of the necessary documentation was contained in the files and properly identified.
- Chain of custody procedures were followed by the Toxicology Section, were complete, and are well conceived.
- Four analytical results (two in each of two separate samples) were generated for blood and urine alcohol testing, and the lowest of the four results was used for the report. Results consistently demonstrated a coefficient of variation that was less than 2%. This means that the results the analyst obtained were all within a narrow range, which increases confidence in the accuracy of the results.
- Urine alcohol conversions were completed in accordance with Texas State law.

Footnote continued from previous page

instrument is calibrated monthly as required by DPS regulations, and officers must renew their breath test administration certification annually.

394 Those six files involved bottles of liquid that were not body fluids. In these cases, the liquids were diluted and tested using the same methodology used for blood and urine alcohol testing.

The six files that were not within the scope of our review reduced the size of our sample by 20%. We consulted PwC to determine whether the sample size was sufficient to provide a meaningful review. We were assured that it was, particularly in light of the lack of deviation in the very consistent findings summarized above.

We also reviewed the Toxicology Section's SOPs for alcohol determination and found the procedures currently used to be state-of-the-art, and exemplary for forensic alcohol analysis. The Section uses dual column, head space gas chromatography with flame ionization detection and performs testing for all samples in duplicate.

C. Assessment of the Toxicology Section's Current Operations

1. The Proper Roles of the Analyst and Investigator

One case that concerned us was a DUI case in which both blood and urine samples from the driver were submitted. In such cases, blood is the preferred sample because the alcohol result indicates the blood alcohol concentration at the time the sample was collected. Urine alcohol concentrations do not reflect the blood alcohol concentration at the time of collection. Instead, they reflect the average of the alcohol concentrations over the entire period the urine was collecting in the bladder, i.e., between the collection void and the last previous void. The information provided by a urine alcohol test may supplement information obtained from a blood test but, by itself, is not as informative as a blood result.

In this case, Mr. Chu analyzed only the urine sample. A note in the file stated that the investigator had called and requested that only the urine and not the blood be analyzed. No further reason is given. Although the analyst should obtain information about evidence from investigators, the decision as to what samples are best to analyze is normally a decision that should be made by the forensic scientist, in consultation with a supervisor if necessary, rather than by the investigator.

2. Technical Reviews

Technical reviews were performed several days or weeks after the date on the report. Because there is currently no other analyst in the Crime Lab who is qualified to perform blood and urine alcohol testing, technical reviews of the Crime Lab's blood alcohol cases are conducted by the DPS laboratory, a process that, unfortunately, causes delays.

3. Report-Writing Formalities

None of the reports we reviewed was signed by the analyst. As is discussed in our general recommendations for the Crime Lab, we prefer to see a report produced on laboratory letterhead, signed by the analyst responsible for the report, and forwarded to the appropriate recipients. This is an important safeguard for both the author and the recipients of the report and encourages analysts to take ownership of the results that are reported.

D. Recommendations

We understand that the Crime Lab is evaluating the Toxicology Section's staffing needs, and it is currently training an additional analyst to perform blood, breath, and urine alcohol testing. There are currently no plans to expand the range of toxicology analyses performed in the Crime Lab unless HPD experiences a large increase in demand for these services. We agree that expanding the range of toxicology services provided by the Crime Lab beyond alcohol analysis is not advisable at this time for a number of reasons:

- The current configuration of the Crime Lab, and the Toxicology Section's proximity to the Controlled Substances Section work area, would create ongoing risks of contamination caused by materials handled in the Controlled Substances Section work area. If the range of analyses provided by the Toxicology Section is expanded, the tests must be performed in a location as far removed from the Controlled Substances Section as possible.

- An expanded analysis program should be led by a very experienced forensic toxicologist, preferably one who has completed a relevant doctoral program.

Based on our historical case review and on our review of the Toxicology Section's current operations, we also make the following recommendations and observations:

- We understand that Crime Lab managers are already considering using commercially prepared calibration solutions, and we encourage them to do so.

- The Crime Lab should resume participation in an external forensic alcohol proficiency testing program for Toxicology Section analysts.

VII. The Questioned Documents Section

In connection with our review of the current operations of the Questioned Documents Section, we reviewed the 18 cases that Mr. Carodine, the Crime Lab's sole questioned documents examiner, completed between May 2005 and December 2006.

We continue to be concerned about the underutilization of the Questioned Documents Section. HPD has failed to take advantage of the high quality work performed by its questioned documents examiner, even after the Section's untapped potential was highlighted in our Fourth Report, which was released on January 4, 2006.

A. The Appropriate Role of a Technical Review

Technical reviews are now performed after Mr. Carodine generates a report, usually within a few days. Although this arrangement is less than ideal and it would obviously be preferable for the review to be performed before a report is issued, it is acceptable for accreditation purposes and, under these circumstances, is necessary because the Section is a one-person operation.

The one minor issue noted during our most recent evaluation of the Questioned Documents Section involved a single document submitted in connection with an IAD case. No known writing was ever submitted for comparison. Mr. Carodine made some observations in the file regarding indications of left-handedness, but determined that there was not enough writing on the document to reach any positive conclusions about the writer.

When interviewed about the determinations made in this case, Mr. Carodine stated that he relied, in part, on the opinions of an outside technical reviewer. Mr. Carodine explained that he deferred to the technical reviewer because the reviewer had significantly more experience in document examination. However, technical reviews are to be performed after the examiner's report is written because they serve a quality assurance function and test the validity of the examiner's findings. As such, they should be performed only after the document examiner has reached his or her own conclusions about the case. However, because Mr. Carodine is the only questioned documents examiner at HPD and, therefore, had no one to consult internally, it is to his credit that he discussed the technical issues in this case with the outside reviewer.

B. Underutilization of the Section

We continue to be concerned by the relatively small workload of the Questioned Documents Section in a city as large as Houston, and we believe that there is tremendous potential for the Section if utilization can be increased. When our Fourth Report was issued in January 2006, only 91 cases had been worked to the point of generating a written report during the approximately five-year period from 1999 to 2004. During 2005 and 2006, an additional 20 new document cases were received and worked by the Section (11 cases in 2005 and 9 in 2006). Intervals between cases submitted to the Section have ranged from 30 to 74 days.[395]

---

395 Mr. Carodine reports that he provides meaningful administrative assistance to the Crime Lab during the intervals between cases. He has, for example, been assigned responsibility for the Crime Lab's training manual. He also participates in a variety of professional development activities in the questioned documents field. From 1998 to 2004, Mr. Carodine was given

Footnote continued

There are a few possible explanations for the underutilization of the Questioned Documents Section. One may be that investigators are unaware that the Crime Lab has an operating Questioned Documents Section. Another possibility may be that they are not sufficiently aware of how document examination can assist their investigations. Yet another possibility is that investigators have become discouraged after submitting evidence to the Section and receiving inconclusive results.[396] Whatever the reasons, HPD is not fully utilizing its highly competent document examiner.

C. Recommendations

A police department in a city the size of Houston should be generating significantly more work for its document examiner. We therefore recommend the following:

- HPD should adopt a policy requiring that all potential questioned document evidence be submitted to the Questioned Documents Section for examination. Questioned document evidence should be defined to include all robbery notes, suicide notes, drug tally sheets, gambling tip sheets, bomb threats, threatening letters, and a wide variety of documents in fraud cases.

- The Crime Lab should provide training sessions on recognizing document evidence for all crime scene technicians, department units, and training schools. These sessions should cover all of the types of evidence described above, as well as writings that appear on building surfaces.

- Mr. Carodine should contact other forensic document units and examiners in other law enforcement agencies to determine how they disseminate information about the capabilities of their units throughout their agencies. Attending at least one national meeting and one regional meeting of forensic document examiners each year would facilitate this process. Such meetings also provide professional development and training opportunities that are especially important in a one-person, underutilized operation.

Footnote continued from previous page

additional tasks to fill his time when the Questioned Documents Section was a component of the Identification Division.

396 This is a common (and misguided) complaint by investigators about document examination. Questioned documents examiners will often be unable to make a conclusive determination because inadequate specimens are submitted for examination. For example, the examiner cannot make a conclusive finding when he is working with a poor photocopy of a document.

We believe that raising the profile and increasing the use of the Questioned Documents Section would assist in maintaining the Section's credibility. As investigators see that investigative leads and positive results are generated from document submissions, the value of questioned documents examinations will become obvious, and demand for these important services will increase.

Review of the Property Room and Recommendations

The methods used for collecting, storing, and tracking evidence can have a significant impact on the Crime Lab's forensic work. In 2004, HPD disclosed that evidence from 8,000 criminal cases had been improperly stored and inventoried in the Property Room. As a result, evidence from at least 33 cases was inadvertently destroyed. Because of well-founded public concern regarding this disclosure, a review of the Property Room and Central Evidence Receiving ("CER") was included in the scope of our investigation.

The more recent and profoundly troubling disclosure that 19 guns from the Property Room are missing, and that two additional firearms missing from the Property Room were found in the possession of suspects arrested by HPD, underscores the urgency of addressing issues relating to the Property Room. The conditions at the Property Room are a threat to the public safety and to the safety of Property Room employees, and they threaten to undermine the ability of Houston law enforcement agencies to perform their missions.

To perform the analysis presented below, we evaluated numerous sources of information:

- we toured Property Room facilities and CER;
- we reviewed HPD's investigative and research material related to Project 280 (discussed below);
- we met with or conducted telephone interviews with personnel from CER, the Property Room, Latent Fingerprint Unit, Homicide Division, Narcotics Division, Crime Scene Unit, Major Offenders Unit, and Technology Services Division;
- we interviewed representatives of the District Attorney's office, the Harris County Courts, and the Harris County Sheriff's Office; and
- we reviewed a 1996 Property Room Security Study prepared for then-Chief Sam Nuchia (the "Nuchia Report"), audit reports prepared by the Inspections Division between 1998 and 2006, and a recent report issued by Joe Latta, a

consultant hired by HPD to provide a Review and Assessment of the Property Room (the "Latta Report").[397]

Our objective in performing this review was to identify technical and organizational challenges that have the potential to impair the integrity of evidence, make evidence difficult to locate or retrieve, or otherwise undermine the Crime Lab's effectiveness. We also provide detailed recommendations for addressing the identified issues. Perhaps our most important finding, however, is that much of what is reported and recommended here is not new. Some of the issues described below have been discussed, evaluated, assessed, and reported for at least ten years. In fact, the 1996 Nuchia Report made the unfortunately prophetic observation that weapons and other evidence in the Property Room were not secure and that "publicity from the loss of evidence . . . would be very detrimental to the department."

News of the missing firearms may ultimately prove to have a positive effect if it creates sufficient momentum for the change that is necessary and long overdue. The commissioning of the Latta Report was a very positive step towards improving Property Room Operations. While our review was focused narrowly on issues that affect the Crime Lab, Mr. Latta was hired by HPD to perform a comprehensive review that encompasses all aspects of the intake, disposition, and storage of evidence. It is a thoughtful, well-conceived, and clearly-presented report. It should be reviewed carefully by members of the City Council and HPD as they evaluate options for responding to recent events involving the Property Room.

In particular, we urge serious consideration of the following observations and points made in the Latta Report, many of which mirror the observations we have made during the course of our review of HPD's practices and procedures related to the collection and storage of evidence:

---

397 When we first learned that Mr. Latta had prepared a detailed report for HPD on Property Room issues, we requested a copy. HPD resisted our request for a copy of the Latta report until after it made the recent disclosures regarding the missing firearms. HPD advised us that it originally declined to produce the Latta report out of a concern that access to the report would potentially diminish the originality or thoroughness of our review of the Property Room. This position misapprehends the purpose of our investigation, which is to provide a public report of the status of HPD's operations concerning the collection and storage of forensic evidence and of HPD's current efforts to improve those operations. Mr. Latta's observations and advice to the Department are relevant to our fulfillment of that purpose. HPD deserves credit for commissioning Mr. Latta's review, which was thorough and professional, and we encourage the City and HPD to implement his recommendations.

- Until construction of the new, centralized Property Room is complete, significant changes are needed to improve the security of Property Room employees and the evidence stored there.
- All evidence submitted to the Property Room and the ancillary facilities used to store evidence must be tagged into a centralized evidence tracking system.
- The need to acquire a new evidence tracking system that assigns numbers in a logical, consecutive order is urgent.
- The dysfunctional bar code system currently used is an insurmountable obstacle to establishing order in the new Property Room and should be replaced as soon as possible to enable HPD to perform a comprehensive audit and reconciliation -- and, where appropriate, dispose of material -- before the move to a new facility.
- Significant staffing increases are needed in the Property Room.
- City, County, and State Codes should be amended to facilitate a more streamlined evidence disposal process.
- The City should invest in high-density shelving for the new facility because doing so will ultimately be far more cost effective in terms of personnel and space required to manage the evidence.
- Aggressive efforts should be made to dispose of unneeded bicycles. Bicycles are occupying nearly 25% of the existing Property Room space, and there is no conceivable evidentiary need to retain the overwhelming majority of the bicycles.

I. Facilities Used for Crime Lab Evidence

A. The Property Room

The Property Room is operated under the Property and Supply Division of HPD and is located at 1103 Goliad Street. It is comprised of two main areas. One area houses central receiving; the evidence tracking system; the administrative area; file storage; a vault for high value evidence; and property storage areas for firearms, knives, digital equipment, and small item evidence. Although this area is air-conditioned, it remains susceptible to high heat and humidity. The second, and much larger, component of the Property Room consists of a large, single-floor warehouse and an annexed three-story warehouse, known as the Volker Building.

The existing Property Room facility has two well-recognized, major deficiencies: (1) inadequate storage space and (2) lack of humidity and temperature control. In

addition, the facility has had major ongoing maintenance problems over the last 15 years, which have included roof leaks, faulty electrical wiring and lighting, inoperable elevators, asbestos concerns, and the need for new windows and doors.

The deficiencies described above are well recognized. We understand that the City has allocated funds to improve conditions in the existing Property Room. Preparations have begun for construction of a new Property Room at 1202 Washington Avenue, which HPD representatives say will be "state-of-the-art."[398] Construction of the new Property Room is currently scheduled to begin during the summer of 2007 and to be completed in December 2008.

B. Central Evidence Receiving

CER is located on the 25th floor of HPD headquarters, located at 1200 Travis Street. It is a section operated by the Crime Lab, and its primary function is to receive all controlled substance evidence. CER consists of three distinct rooms, which are all protected by cipher locks to restrict access. The first room is the administrative area, where evidence is received, administrative files are stored, and evidence awaiting assignment to a Crime Lab analyst is held. Next to the administrative area is the "bulky room," which, as the name implies, is where large pieces of evidence that have been seized are stored pending determinations regarding the type and amount of evidence that will be analyzed or destroyed. The bulky room is also used by analysts to perform examinations on these large pieces of evidence.

CER also contains a room with a long-term storage evidence vault. Numerous rows of shelving contain very large quantities of controlled substance evidence, and the floor is sometimes piled high with containers of evidence awaiting destruction or assignment to a particular storage spot. Much of the evidence in this room is awaiting destruction, but, because of the cumbersome destruction process established by HPD, Harris County, and the State of Texas, the room is overloaded and difficult to manage.

Evidence scheduled for destruction is also stored in another room adjacent to the bulky room. Access to the bulky room is limited to the CER supervisor, the Crime Lab director, and the Controlled Substances Section manager. The space allocated to the important function of transferring and storing evidence lacks adequate ventilation. It also lacks adequate storage space for bulky evidence and evidence being held for presentation in court or for destruction.

---

398 The City's 2007-2011 Capital Improvement Plan states that $12.75 million have been earmarked for construction of the new Property Room.

II. Past and Current Issues Relating to the Property Room

A. Project 280

Beginning in the early 1980s, the Property Room allowed various divisions of HPD, including the Crime Lab, to store items on the third floor of the Volker Building. The items stored on the third floor were considered to be under the control of the divisions that deposited the items and were not tagged or inventoried by the Property Room. Crime Lab evidence was stored in envelopes and boxes placed inside larger boxes, which were stacked against a wall under several windows. Some boxes and evidence were damaged by rodents or by rainwater that leaked through the windows and roof.

In early 2000, the Property Room began to run out of space to store evidence in its custody, and divisions storing property on the third floor of the Volker Building were asked to remove their items. Crime Lab personnel placed the contents of the damaged boxes of evidence in 283 new, large cardboard boxes. Each of the 283 boxes contained multiple pieces of evidence from multiple cases, and some contained evidence from as many as 100 cases. The evidence dated from the 1960s to the early 1990s.

According to an internal review performed by HPD, Crime Lab personnel tagged the boxes to transfer custody to the Property Room. They identified each box by an incident number that related to only one of the many items of evidence contained in each box, which misleadingly suggested that each box contained evidence relating to only a single case. In fact, each box contained evidence related to many cases. At some point, two of the 283 boxes were checked out of the Property Room by Crime Lab personnel. The pieces of evidence contained in those two boxes were tagged as individual pieces of evidence and checked back into the Property Room. Thus, those two boxes were no longer part of the original 283-box collection.

On September 21, 2000, the Property Room received a routine destruction order to dispose of certain evidence. Coincidentally, the destruction order related to an incident number that happened to be listed on the outside of one of the 283 boxes. Because the Property Room personnel believed, based on the box's label, that the box contained evidence related only to the one incident identified in the destruction order, they destroyed all of the box's contents. It was later determined that this box contained evidence from 33 cases in addition to the one case identified on the box label.

In November 2003, the remaining 280 boxes were moved from the Property Room to a section of the 24th floor of HPD headquarters to protect the evidence from further degradation. On August 1, 2004, the Inspections Division began cataloguing

and tagging the evidence contained in these remaining boxes. Approximately 8,000 individual evidentiary items were identified in the boxes.

B. Current Issues

1. HPD Identifies Twenty-One Missing Firearms

On April 25, 2007, HPD officials announced that a total of 21 weapons had been identified as missing from the Property Room. Two of those weapons were recovered from suspects who have since been charged with unlawful weapons possession. The loss of the weapons from the Property Room is the subject of an ongoing IAD investigation.

The first weapon identified as missing from the Property Room was identified through a 2005 Evidentiary Property Reconciliation audit. (This is identified as an "annual" audit, but no audit of 2001 inventory was performed and a three-year gap in the auditing process occurred between 2002 and 2005.[399]) The most recent audit (which covered inventory submitted during 2005, but was performed in the fall of 2006) revealed that a 9 mm semi-automatic pistol was missing from the Property Room; a follow-up audit identified another missing weapon. HPD officials advised us that the IAD investigation that ensued resulted in a complete audit of the entire Property Room firearms inventory and the identification of an additional 19 missing weapons. Two civilian Property Room supervisors have been relieved of duty while the IAD investigation continues.

2. Current Evidence Handling Operations

Our review of current evidence handling operations was designed to identify issues that affect the ability of the Crime Lab to provide timely, accurate information. We, therefore, evaluated the flow of evidence from the time of collection to disposition to identify factors that may affect the Crime Lab's effectiveness, as well as possible solutions to those issues.

a. Evidence Submission

All trace, biology, and firearms evidence is sent directly to the Property Room unless an HPD officer makes a direct submission to the Crime Lab. Controlled substances and toxicology cases are submitted to CER. Occasionally, buccal and other

---

399 We received copies of audit reports relating to evidence submitted to the Property Room in 1998, 1999, 2000, 2002, and 2005. In those reports, the Inspections Division reported that 100% of the items sought by the auditing team were retrieved during the 1998-2000 and 2002 audits.

swabs are also submitted to CER. Evidence is usually submitted to the Property Room and CER in one of either two ways: (1) an officer brings evidence directly to the appropriate facility or (2) evidence is stored in secure lockboxes at several different HPD locations and later transported to the appropriate facility.

3. The Property Room

All evidence that is not toxicology or controlled substances evidence is supposed to be submitted to the Property Room. However, there are no clearly written policies regarding the submission of certain categories of evidence (like questioned documents and firearms evidence), and investigators report confusion and uncertainty about proper evidence submission processes, particularly among patrol officers.

In practice, questioned documents are submitted directly to the examiner, and, as a result, the Property Room never has any record of the submission of questioned documents evidence. The questioned documents examiner accepts property from a variety of sources and often processes the evidence in the presence of the submitting officer. The examiner occasionally retains the evidence for a brief period and then returns it to the submitting officer, who may store the evidence in the case file. We also learned that individual investigators sometimes store video and audio tapes with their investigative case files. These items should be submitted, tracked, and stored in the Property Room consistent with other types of evidence.

4. Central Evidence Receiving

We observed the evidence submission process at CER and noted the following deficiencies:

- improper seals on evidence envelopes;
- evidence envelopes that were not accompanied by submission forms;
- evidence envelopes that were blank (but accompanied by completed submission forms); and
- a lockbox inventory that did not list the entire inventory actually contained in the lockbox.

All of the above deficiencies require the CER technician to make appropriate changes to paperwork and evidence seals and to document those changes. CER personnel report that between 20 to 40% of the evidence it receives is improperly sealed or accompanied by incomplete paperwork. Because errors are corrected by CER technicians, officers responsible for the deficiencies do not receive corrective feedback.

C. Evidence Storage and Tracking Issues

1. Storage of Biological Evidence

Storage of biological evidence has been an ongoing problem for the Property Room. The primary issue is the lack of sufficient temperature-controlled space for storing such materials. Before 1998, the Property Room stored sexual assault kits and other body fluid evidence in a freezer for a period of 18 months. After 18 months, the evidence was moved to air-conditioned areas in the Property Room for long-term storage. By 1998, the Property Room was running out of space in the freezers as well as in the air-conditioned storage area. In March 1998, the former head of the Property Room, Ron Cobb, asked Mr. Bolding if it was necessary to provide air-conditioned storage for this evidence after the initial 18-month period of storage in the freezer. In a March 18, 1998 memorandum to the Captain of HPD's Homicide Division, Mr. Cobb relayed the response he had received from Mr. Bolding:

> [T]here is NO need to provide air-conditioned storage for any type of body fluid evidence after the original freezer period of 18 months. [Mr. Bolding] related that he has taken evidence that was stored on the third floor of this building (which reaches extremely high temperatures in the summer), and has achieved successful DNA testing. [Emphasis in original.]

On April 1, 1998, in reliance on the information received from Mr. Bolding, Property Room personnel began relocating sexual assault kits and other biological evidence to general property storage areas, which are not air-conditioned and, therefore, are subject to high humidity and temperatures. Although it is true that it is not necessary to freeze biological evidence (for example, bloodstained fabric), such evidence is much more likely to degrade in a high humidity, high temperature environment. This practice, therefore, raises serious concerns about HPD's current practices for storing biological evidence.[400] Additionally, CSU personnel report that instructions received from the Crime Lab and the Property Room regarding the freezing or refrigeration of biological evidence have caused some confusion; hence, these policies should be more clearly communicated.

---

400 For example, in May 2004, water caused damage to 10 to 12 boxes of evidence due to a roof leak. Nine of these boxes contained clothing with possible biological evidence. The wet clothing was removed and hung to dry before being checked back into the Property Room.

2. Storage in CER

Evidence that fits into evidence envelopes is stored in CER based on the order of its laboratory number. Larger items are stored in other sections of the CER vault on a space available basis. As is discussed in greater detail below, locating some of these larger items is frequently difficult and depends largely on the institutional memory of the searcher. High turnover rates among CER clerks, attributed mostly to low salaries, contribute to the difficulty of retrieving this type of evidence.

Bulk evidence that is being analyzed or awaiting analysis remains in the "bulky room." Only CER personnel, the Crime Lab director, and the Chemistry Section supervisor have unrestricted access to the room. If a chemist needs access to bulky evidence, one of the individuals identified above must be present and remain in the room until the chemist has completed her work.

Finally, we found that controlled substance evidence is stored in CER for extended periods awaiting destruction orders. This results in severely limited storage space.

3. Storage of Firearms Evidence

According to the Latta Report, the Property Room had a total firearms inventory of more than 21,000 weapons at the end of 2006. Evidence, including weapons, from approximately 3,000 firearms cases is stored in the Crime Lab's firearms vault rather than in the Property Room. Some of the evidence in the firearms vault dates back to 1998 cases. At the time of this review, there was no position funded for a firearms evidence technician, so a firearms examiner in training is responsible for moving the evidence between the Property Room and the Firearms Section of the Crime Lab. As a result, it has been approximately two years since examined firearms evidence was transferred to the Property Room.

At the time of our interviews with Firearms Section personnel, we were told that the contents of the firearms vault had never been inventoried. HPD advised us that it conducted a complete inventory and reconciliation of weapons stored in the Property Room after the October and November 2006 discovery that two guns were missing from the Property Room.[401]

---

401 The missing firearms were stored by the Property Room, not in the Firearms Section's vault.

D. Evidence Tracking and Chain of Custody

1. Records Management Systems

Under existing protocols, evidence collected by HPD personnel can be found in the Property Room, the Crime Lab, the District Attorney's Office, the Harris County District Court clerk's office, or the Sheriff's property room. Investigators reported to us that locating evidence is a major problem because of poor tracking systems. HPD's central OLO reporting system, which was implemented in the mid-1980s, does not contain an evidence-tracking program, and there is no interoperability between OLO and a bar-coded evidence tracking system (described below) that was adopted by the Property Room. By comparison, many laboratory information management systems ("LIMS") designed for the forensic laboratory setting also have evidence tracking functionality.

We understand that HPD is preparing to upgrade its records management systems and that the possible acquisition of a LIMS for the Crime Lab is under consideration. We were previously advised that HPD expected to have an improved electronic evidence tracking system, known as EMAPS, on line by the fall of 2005. In a December 2006 follow-up interview, we were told that the EMAPS vendor went out of business and that, accordingly, this program will not be implemented. A radio frequency identification ("RFID") evidence tracking system is reportedly now under consideration.

2. The Property Room

The Property Room first began using a computerized evidence tracking system and bar-coded evidence tags in the late 1980s or early 1990s. The bar code system is used to track the location of evidence inside and outside of the Property Room. This system is obsolete and requires a significant amount of paperwork. One bar code is attached to the HPD's Property and Evidence form, and a different bar code is attached to the corresponding evidence. Therefore, the bar-coded number on the paperwork is not the same as the bar-coded number on the associated item of evidence. Moreover, the bar-coding system currently used by the Property Room uses an alpha-numeric system that does not permit a logical, sequential process for storing evidence. [402]

---

402 For example, a Property Room form could be given a bar code with the alpha-numeric code G3P7, while the bar code placed on the corresponding piece of evidence would have an alpha-numeric code such as G3P9.

The Property Room also uses a number of cumbersome and archaic forms to track chain of custody. These forms increase the chance of errors and the risk of misplaced evidence. When evidence is transferred to an analyst, the chain of custody form travels with it, and no record of the transfer is retained by the Property Room.

Another chain of custody issue arises when CSU investigators deliver a large number of items to the Property Room. Because of other time demands, it is sometimes not possible for the investigators to wait for a Property Room inventory receipt. As a result, the original HPD submission form remains with the evidence at the Property Room, which can result in a break in the chain of custody documentation.

Investigators reported that current Property Room procedures do not allow the removal of a single piece of evidence when multiple pieces of evidence have been submitted in one sealed container. We also understand that Property Room clerks follow different procedures regarding the handling, submission, and retrieval of evidence. For example, some clerks place bar codes on individual items, while others only put a bar code the outer container. When the latter occurs, investigators are forced to retrieve the entire container, rather than an individual item. As a result, investigators occasionally retain the unneeded evidence in unsecured locations, including desks and cabinets that are not designed for evidence storage.

3. Central Evidence Receiving

Only one copy of the evidence submission form is forwarded to CER when evidence is submitted. When evidence is transferred to an analyst, the evidence submission form travels with the evidence. (This is also true in the Property Room.) As a result, the provider of evidence has no record to demonstrate that the transfer occurred if evidence is missing.

E. Evidence Retrieval

1. The Property Room

Crime Lab personnel have reported delays in the retrieval of various pieces of evidence from the Property Room. Managers and investigators also report difficulty locating specific evidence for examination or trial or in response to defense motions to produce evidence. We have been told that, in some cases, efforts to retrieve evidence are futile.

Paper bags, boxes, and a variety of other containers are used to store most pieces of evidence, which, among other things, make retrieval more difficult because the evidence is difficult to see without breaking the seal and removing the evidence from the container. Removing the evidence creates unnecessary risks that can be avoided by

submitting evidence in transparent plastic evidence bags. For example, evidence can be lost or stolen, create a hazard, or become contaminated when removed from its container. Many law enforcement agencies use breathable clear plastic bags or envelopes to improve the ability to observe and retrieve evidence.

2. Retrieval for Laboratory Analysis

When material located in the Property Room must be retrieved for analysis by the Crime Lab, the investigator prepares an OLO supplement requesting analysis and sends it to one of two designated printers in the Lab. The printers are checked daily by analysts and the Crime Lab Case Manager. The Case Manager checks to see if a lab number has been assigned to the case. If not, the Case Manager sends a request to CER for the assignment of a lab number and preparation of a lab folder. Once this is completed, CER delivers the new folder (with the newly created lab number) to the Crime Lab.

The Crime Lab Case Manager retrieves the prepared folder and delivers it to an analyst or inventory management clerk. The inventory management clerk prepares a "Temporary Release of Property Receipt" and "Chain of Custody" form. She faxes a list of evidence she intends to retrieve to the Property Room, as well as a list of evidence she expects to return before going to the Property Room. The inventory management clerk then retrieves the evidence from the Property Room and transfers its custody to a Crime Lab analyst. Investigators requesting evidence examination do not receive any acknowledgment that their request has been received, nor are they notified when the Crime Lab has completed its report.

To test the evidence retrieval system, we asked property clerks to locate evidence from 20 homicide and 27 sexual assault cases. Evidence from the 20 homicide cases, which included many different types of forensic evidence, was all found within five minutes of our request. Most of the evidence from the sexual assault cases was also readily located. However, five sexual assault kits took 90 minutes to locate because they had been transferred to the Crime Lab, had been returned to the Property Room, and then were stored in a temporary storage area pending transfer to the Travis Street Property Room location.

3. Central Evidence Receiving

CER personnel have created a computerized Access database that provides very limited assistance in locating controlled substances evidence analyzed by the Crime Lab. The Access database contains case assignment information and is networked between CER and the Crime Lab on the 26th floor of HPD headquarters. If analysis of evidence is a priority, a supervisor is notified, and he assigns the case to an analyst.

Otherwise, CER personnel assign the cases; the case assignment is entered first into a CER logbook and then into the Access database. When evidence from CER cannot be located using Access, the alternative methods for hunting down the evidence are tedious and cumbersome. It must be emphasized that Roger Capan, the CER supervisor, has done an excellent job managing this process, despite antiquated programs and lack of personnel.

We found that storage and retrieval of controlled substances evidence for Crime Lab analysis is extremely difficult because of understaffing and inadequate storage and workspace. Large evidence seizures and evidence awaiting destruction or filing are stored in the aisles and work areas in the CER complex. The clutter and crowding of the workspace make retrieval and filing of evidence more difficult.

F. Audits of Inventory and Destruction of Property

1. The Property Room

HPD performed annual audits of samples of evidence inventoried in the Property Room during 1998, 1999, 2000, and 2002, and all selected evidence was reportedly located in those audits. For reasons that have not been adequately explained to us, a more than three-year gap in Property Room auditing occurred between the audit of 2002 inventory (the audit was completed and reported in January 2004) and the most recent audit (which was reported in March 2007). Shortly before HPD disclosed that 21 weapons were known to have been missing from the Property Room, we were told by the now-suspended Property Room manager that theft and misplaced evidence were not serious problems in the Property Room.

We were told that a full inventory of evidence in the Property Room has never been performed, partly because of limited staffing and partly because there is simply insufficient space for the enormous amount of evidence-shuffling and sorting required to perform such an audit. Limited staffing also has prevented the Property Room from developing an efficient evidence disposal program. Timely destruction of property is a critical element of efficient property room management, as is the proper management of records.

2. Central Evidence Receiving

As is true in the Property Room, a complete inventory and reconciliation of evidence in CER has never been conducted. There is currently no routine accounting of controlled substances evidence through annual auditing. Because a review and

assessment of CER physical security was conducted by Evidence Control Systems,[403] our investigative team did not evaluate this issue. However, a substantial quantity of controlled substance evidence is stored in the CER area, and additional physical security measures merit serious consideration.

G. Standard Operating Procedures

The Property Room lacks a comprehensive, updated set of SOPs. Instead, procedures governing Property Room operations are contained in various memoranda that lack revision dates, and some of the written procedures that do exist do not reflect current practices. Procedures that are in place are not clearly understood by all employees, and inconsistent practices cause significant confusion and frustration among law enforcement personnel who are submitting or retrieving evidence.

Understaffing at the Property Room prevents existing personnel from developing and updating SOPs, and the implementation of an ideal online SOPs resource that could be available to all HPD investigators and Property Room personnel simply is not feasible at the current staffing levels. Moreover, Property Room personnel require basic and refresher training on proper evidence handling procedures, but there are currently no funds budgeted for such training or for memberships in professional organizations.

We were informed that a "Property and Evidence Committee" has been in place for a number of years and was expected to complete revisions to the Property/Evidence Control Regulations in December 2006. Committee members include most of the stakeholders involved in evidence and property issues.

H. Recommendations

The primary purpose of our review of CER and the Property Room was to understand evidence handling issues that have the potential to affect the integrity of evidence or otherwise undermine the effectiveness of the Crime Lab. Many of the recommendations provided below have global application and are, therefore, equally relevant to other uses of evidence.

---

403 Evidence Control Systems, Inc. is the consulting firm retained by HPD to evaluate the Property Room. Joseph Latta is the President of Evidence Control Systems and the author of the Latta Report.

Additionally, we reiterate our strong recommendation that HPD and the City give careful consideration to the advice contained in the Latta Report, particularly the points summarized above.

1. Global Evidence-Related Recommendations

We have the following global recommendations regarding HPD's collection, packaging, and storage of evidence.

- HPD should develop standard evidence procedures specifically for all types of forensic evidence and require that evidence be submitted to one central location, rather than to the several units that are currently used (including the Property Room, CER, the Firearms Section, and the Questioned Document Section).

- All long-term storage of forensic evidence should occur in one location, rather than the multiple locations currently used in the Harris County criminal justice system.

- A new evidence tracking system must be implemented that includes complete seamless integration with all of the existing evidence tracking systems. The software vendor(s) and HPD management should be held accountable for the creation and implementation of a new evidence tracking system that integrates all evidence in the Property Room and CER into a user-friendly, numerically sequential program.

- Until improved evidence tracking software is installed, a multi-part chain of custody form or a photocopy receipt should be used so that chain of custody documentation of the evidence transfer remains with the section or unit that transferred the evidence, as well as with the entity to which it has been transferred.

- Many law enforcement agencies currently use transparent, breathable evidence bags. We recommend that these should be provided to all HPD personnel that collect, submit, examine, or handle evidentiary items. A variety of bag sizes and types are available, and they can accommodate large and small items, as well as long firearms and biological evidence. Bags can be purchased without labels or with evidence labels permanently affixed.

- HPD should emphasize the proper collection, packaging, and submission of all types of forensic evidence -- including biological evidence and suspected controlled substances evidence -- during in-service training. Investigative and patrol supervisors should ensure that officers in their command follow proper procedures and practices related to the collection and handling of evidence.

- In order to reduce the unnecessary retention of evidence in resolved cases, investigative supervisors should be required to provide a detailed justification in response to requests from the Property Room seeking authorization to destroy evidence if the determination is that the evidence should be retained.

- We understand that the limitations of OLO are well recognized and that efforts to implement a new records management system ("RMS") are under consideration at HPD. We strongly suggest that the following features be included in any RMS adopted by HPD:

  - The RMS should work effectively with any evidence-tracking and LIMS adopted by the Property Room and the Crime Lab.

  - The RMS should accommodate identification numbering systems used by other agencies in the Harris County criminal justice system. For example, case information should be retrievable using any one of the various identification numbers assigned by different agencies or HPD divisions to the same matter.

  - An acknowledgement of receipt should be generated whenever an investigator's request for examination of evidence is sent to the Crime Lab.

  - Investigators who have requested examination of evidence by the Crime Lab should be notified automatically when results of the analysis are available.

2. Central Evidence Receiving

We have the following recommendations intended specifically for CER.

- Because 20 to 40% of the cases submitted to CER are reportedly improperly sealed or marked, officers who make direct submissions should be provided a work area with supplies where they can remedy the deficiencies. When evidence deposited in lockboxes has been handled or submitted improperly, the submitting officers' supervisor should be notified of the deficiencies so that the errors can be corrected and the responsible officers provided remedial training regarding the proper collection and submission of evidence. Finally, CER should review current departmental guidelines for relevance and provide training to officers on evidence submission procedures.

- HPD should create a career ladder for CER by implementing senior inventory clerk or evidence technician positions to address the high turnover in this unit, which contributes to the inefficiency of the transfer, storage, and disposal of

evidence. Current pay levels are inadequate for personnel who are given a great deal of responsibility for handling and accounting for evidence.

- Staffing in CER is inadequate, and all vacant positions (one supervisor and four clerk positions) should be filled immediately.
- CER and HPD should review existing evidence destruction procedures to identify ways to reduce the time evidence is stored at CER after adjudication.
- A complete inventory and reconciliation should be conducted immediately in CER, and periodic audits should occur on a regular basis in the future.
- We strongly recommend improved physical security measures in CER.

3. The Property Room

We have the following recommendations related to evidence tracking and storage by the Property Room.

- The Property Room should conduct an inventory and reconciliation immediately. Permanent staff should be hired to coordinate a complete annual inventory and reconciliation, as well as ongoing periodic audits.
- To develop an efficient evidence disposal program, HPD should increase Property Room staffing to include one supervisor and two clerks whose sole responsibility is evidence destruction. Timely destruction of property is a critical element of efficient property room management, as is the proper management of records.
- Because Property Room procedures are inconsistent and not clearly understood, managers must develop written policies and procedures for all property room operations. These policies and procedures must be understood by all employees and implemented in a uniform and consistent manner. HPD should authorize the hiring of one administrative manager to develop and update Property Room SOPs describing property room operations and proper procedures for submitting evidence to the Property Room. These SOPs should be available online so that all officers, investigators, and other HPD employees responsible for handling evidence can have easy access to the SOPs.
- HPD should allocate funding to provide Property Room personnel with basic and refresher training on proper evidence handling procedures. HPD should also provide funding for membership in appropriate property room trade associations.

- The Property Room storage facility is sorely in need of replacement with a modern, secure, climate-controlled warehouse large enough to accommodate all HPD evidence, to include forensic evidence, with room for expansion. HPD should vigorously pursue its plans to design and build an appropriate storage facility that can accommodate all property and evidence currently in HPD custody. The new facility should be large enough to accommodate all forensic evidence (controlled substance, biological, firearms, questioned documents, fingerprint) and non-forensic evidence and property. The design should include enough expansion space to satisfy HPD needs until 2027.

- Video and audio tapes that are currently stored in case files should be stored (under appropriate temperature and humidity conditions) as evidence in the Property Room.

4. Recommendations for the Crime Lab

The following recommendations are for the Crime Lab regarding forensic evidence collection, handling, and storage:

- The Crime Lab should be interacting more with investigators and patrol officers regarding evidence collection techniques, as well as successes or failures relating to evidence handling issues. Crime Lab personnel should be directly involved in the training of CSU investigators.

- The Firearms Section should develop policies and procedures governing the submission of all types of firearms evidence.

- HPD should hire an inventory management clerk to transport all firearms evidence between the Property Room and the Firearms Section, and the large amount of firearms evidence that is currently held in the Section vault should be moved to the Property Room. The current practice of using an examiner to transport evidence is an inefficient use of resources and has resulted in the accumulation of a large amount of evidence in the Firearms Section.

- The Crime Lab should consider having all questioned document evidence submitted to the Property Room in a manner consistent with other property submission requirements for laboratory evidence.

The Crime Lab and Property Room should work together to communicate (and develop, if necessary) consistent policies and procedures regarding the storage of biological evidence.

Conclusion

More than four years ago, HPD was shaken by a series of devastating disclosures focusing primarily, but not exclusively, on the Crime Lab's DNA work. After re-testing by outside laboratories confirmed in March 2003 that DNA analysis performed by the Crime Lab played a central role in the wrongful conviction of Josiah Sutton, the potential implications of the Crime Lab's problems became real. The people of Houston and many of the City's public officials quite appropriately questioned how many wrongful convictions may have been obtained based on flawed forensic evidence and its presentation to Harris County juries. The City and HPD commissioned this independent investigation, in part, to answer the profound and important questions about the depth and breadth of the problems infecting the Crime Lab and to identify the scientific and management failures that contributed to the state in which the Lab found itself by late 2002.

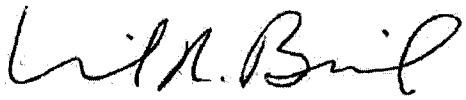
This report reflects an exhaustive effort to examine the full range of issues implicated by the Crime Lab's profound problems that began to be exposed in late 2002 and early 2003. We found that the Crime Lab was starved for resources for the better part of two decades, starting no later than the early 1980s. HPD criminalists were underpaid, poorly trained, and worked in conditions that included, among other things, a leaky roof that HPD did not repair for years, thus allowing rainwater to pour into the Crime Lab. The DNA Section lacked competent supervision and technical guidance, and analysts who had worked in the Section for years were seemingly oblivious to how far their analytical procedures and reporting conventions departed from generally accepted forensic science principles. Under these circumstances, the risk that casework performed by the Crime Lab, particularly by the DNA Section, would lead to miscarriages of justice was unacceptably high. We have described the far-reaching consequences of such failures in the deeply flawed work performed in serology and DNA and the fact that questions generated by that flawed work continue to exist in scores of cases years and, in some cases, decades after the work was performed.

If the initial response was halting and uncertain, the City and HPD have in the past three years demonstrated a commitment to uncovering the full extent of the Crime Lab's historical problems and to taking the necessary remedial steps to make the improvements that the Lab so desperately needed. Over the past several years, the City and HPD have invested heavily -- in resources and attention -- in salvaging and rebuilding the Crime Lab. Funding for the Crime Lab has more than doubled; HPD has significantly increased analysts' salaries, thus significantly improving the Lab's ability to recruit and retain analysts; the Lab has recruited new managers who are competent and take their responsibilities as supervisors and managers seriously; analysts undergo rigorous formal internal training and attend outside training programs; and the Lab has

implemented a credible quality assurance program. Finally, the Crime Lab has been accredited by ASCLD/LAB, an accomplishment that would have been unthinkable and unattainable for the old Lab.

Under its current leadership, the Crime Lab has steadily moved in the right direction over the past three and a half years. Our review of its current operations clearly demonstrates that the Crime Lab now bears little resemblance to the substantially dysfunctional institution that reached its nadir in the late 1990s and early 2000s. Our detailed recommendations are intended to help the Crime Lab improve further. As reflected by our observations and recommendations, there are challenges ahead for the Crime Lab and, in some areas, room for continued improvement. We offer these recommendations in the hope that they will be followed and that they will have a lasting and positive effect on the quality of the forensic science practiced at HPD.

Our most significant concern is that the increased funding and attention that has been central to the Crime Lab's recovery so far may be transitory. After the current spotlight on the Lab's push toward accreditation and on the results of this investigation fades in the near future, the City and HPD must sustain the effort and monitoring that are necessary to ensure that the Crime Lab remains able to perform consistently competent and reliable forensic science analysis. HPD and the City have seen all too clearly the dire consequences for the accuracy, integrity, fairness, and reputation of the criminal justice system when flawed scientific evidence is produced in the Crime Lab, as was the case in the Serology and DNA Sections for many years. Having seen the costs – in money, turmoil, and injustice – that a flawed Crime Lab can produce, HPD and the City must make sure that the needs of the Lab are never again ignored.



Michael R. Bromwich
Independent Investigator
Fried, Frank, Harris, Shriver & Jacobson LLP

June 13, 2007

Appendix A

Stakeholders Committee Members

Adrian Garcia
Houston City Council

Fran Gentry
National Association for the Advancement of Colored People

Sylvia Gonzalez
League of United Latin American Citizens

Rusty Hardin, Esq.
Rusty Hardin & Associates

Richard Li, Ph.D.
Sam Houston State University

Ashraf Mozayani, PharmD., Ph.D., D-ABFT
Harris County Medical Examiner Office

Frank Parish, Esq.
Justice for All and Parents of Murdered Children

Annise Parker
Houston City Controller

Wayne Riley, M.D.
Baylor College of Medicine

Benjamin Roa, Ph.D.
Baylor College of Medicine

Kent W. "Rocky" Robinson, Esq.
Houston Bar Association
Andrews Kurth LLP

Richard Ward, Ph.D.
Sam Houston State University

Anthony Woods, Ph.D.
Texas Southern University

Appendix B

Technical Discussion of Serological Techniques Commonly Used by the Crime Lab

During the 1980s and early 1990s, forensic serology practiced in the Crime Lab in connection with investigations and prosecutions primarily involved ABO typing. The field of forensic serology at the time also included the identification of biochemical genetic markers in blood such as certain enzymes and proteins, but it appears that the Crime Lab rarely used enzyme testing results to associate or disassociate stains with particular individuals.[1] Although we found logbooks recording the results of electrophoretic runs associated with enzyme testing and have seen Lab notes and worksheets in case files reflecting that enzyme testing was performed in certain cases, Crime Lab serologists rarely reported results obtained through enzyme testing. Thus far, we have identified almost no cases in which the Crime Lab reported the results of enzyme testing for use in an investigation or prosecution. Accordingly, this discussion provides an overview only of certain techniques related to ABO testing commonly used by serologists in the Crime Lab.

A. ABO and Lewis Testing of Known Reference Standards

Known reference standards are samples of blood and saliva collected from persons suspected of being associated with evidence stains deposited during criminal activity. Known reference standards are most commonly collected from suspects in the form of a tube of blood drawn from the arm and saliva collected by a cotton swabbing of the lining of the cheek. For example, known reference samples are used to compare a suspect's genetic characteristics, such as blood type, with the genetic characteristics of blood or secretion stains recovered from a crime scene in order to develop evidence indicating that the suspect is included -- or excluded -- as a possible source of the biological material found at the crime scene.

Crime laboratories typically subject known blood reference standards to both ABO testing, in order to determine the suspect's blood type, and "Lewis" testing, which is helpful to predict or confirm whether the suspect can be expected to be a secretor

---

[1] An enzyme is a type of protein that acts as a catalyst for certain specific biochemical reactions. Forensic scientists were particularly interested in certain enzymes and other proteins found in blood -- such as PGM (phosphoglucomutase), EAP (erythrocyte acid phosphatase), EsD (esterase D 1), Hp (haptoglobin), and others -- because those enzymes and proteins are "polymorphic," meaning they exist in different forms and, therefore, are useful in distinguishing between individuals. The various inherited forms of these polymorphic enzymes and proteins are called "alleles." The analysis of such enzymes and proteins involves the separation of the alleles through a process known as electrophoresis.

whose ABO type can be detected in body fluid secretions such as semen. ABO and Lewis testing of the known reference blood samples are normally conducted by testing the antigens on the red blood cells in the reference samples with commercially-available "antisera."[2] This is commonly referred to as "direct" testing because the subject's red blood cells are tested directly by combining known antibodies to the red blood cells in a test well and measuring the test result. A positive test result is manifested by agglutination of the cells caused by the binding of the red blood cell antigens to the antibodies in the test reagent.[3] Such agglutination is clearly observable under low magnification or with the naked eye, and the absence of clumping indicates the absence of the antigen being tested. Thus, for example, if agglutination is observed in the test well containing anti-A antibodies, then the serologist would indicate a positive result for the presence of type A activity.

Known reference saliva standards typically are collected from a suspect on sterile cotton swabs or sterile gauze and allowed to air dry to preserve the sample from mold or bacterially promoted decomposition. The purpose of the collection of a known reference saliva standard is to enable the forensic serologist to determine the subject's ABO secretor status. The method used for testing the dried reference saliva standard is called ABO absorption inhibition ("AI") and is the same method as that used for testing ABO factors present in secretion stain evidence found at crime scenes. The AI testing technique is described briefly below.

B. ABO Testing of Bloodstains by Absorption Elution

Absorption elution (AE) is the generally accepted forensic serology testing method for determining the ABO factors located in bloodstain evidence recovered from crime scenes. AE is also considered to be a type of "direct" testing. AE involves testing the ABO antigens in bloodstains directly by adding commercially-available, known ABO antibodies to the bloodstained material, permitting the antibodies to bind to the ABO antigens in the bloodstain, and then eluting those antibodies from the bloodstains.[4] The ABO typing is then performed by adding red blood cells of known ABO type into test wells containing the eluted ABO antibodies obtained from the

---

2 Anitsera are solutions containing specific antibodies.

3 A "reagent" is a substance used in a chemical reaction to examine or produce other substances. In the context of ABO testing, for example, it is the solution containing antigens and antibodies the reaction of which the scientist is observing in order make a blood type determination.

4 The term "elution" refers to the immunological process of freeing (i.e., eluting) bound antibodies contained in bloodstain evidence from the bloodstains by applying heat to break the antigen-antibody bonds.

bloodstain and observing the agglutination that signals a positive test result for the presence of the corresponding ABO antigens.

Occasionally, blood crusts or evidence items with bloodstains on hard surfaces are submitted to a crime lab for testing. When that occurs, a serologist transfers the bloodstain to clean cotton threads by dissolving the bloodstain into a solution and then allowing the concentrated solution of blood to dry onto the cotton threads. AE can then be conducted on the cotton threads bearing the transferred bloodstains.[5]

C. ABO Testing of Secretion Stains by Absorption Inhibition

Absorption inhibition ("AI") is the generally accepted forensic testing method for determining the ABO factors present in stains related to body fluid secretions such as semen, saliva, vaginal secretions, perspiration, tears, nasal mucous, or mixtures of these secretions. The same AI method is also used to test the known reference saliva standards obtained from a suspect to determine whether he or she is a "secretor" -- i.e., a person whose ABO type is expressed in his or her body fluid secretions.[6]

AI is an "indirect" ABO test method, meaning that the presence of an ABO factor in a secretion evidence stain is determined by observation of a diminished level or absence of agglutination in the test solution.[7] Cuttings from secretion stains (such as from stained underwear, a vaginal swab obtained from a rape kit, or saliva stained cigarette filter paper) are placed into three separate tubes. A small volume of test

---

5 Sometimes AE testing of bloodstains was conducted in conjunction with a form of "reverse" blood typing called the "Lattes Crust" test, after Leon Lattes who developed this technique. Forensic serology laboratories commonly used Lattes testing to obtain ABO typing results from scrapings of dried blood crust collected from hard surfaces, such as glass or a weapon (hence the term "Lattes Crust" test). The Lattes test, however, is less sensitive than AE. Consequently, more bloodstain material must be consumed to conduct a Lattes test than the amount of bloodstain material needed for AE. After other genetic marker systems (polymorphic enzymes and proteins) became available to forensic serologists in the early- to mid-1970s, the use of Lattes testing as an adjunct to AE for ABO typing of bloodstains competed with the other genetic markers for the consumption of limited amounts of bloodstain material and generally fell out of favor in crime laboratories. AE was sufficiently sensitive and accurate to be relied upon for good quality ABO typing of bloodstains without the parallel use of Lattes testing.

6 Bloodstains are not tested by the AI method because, among other things, the concentration of ABO factors in bloodstains is significantly less than the concentration of ABO factors found in secretion stains. Consequently, the forensic serologists typically use the direct AE method to test bloodstains, which is more sensitive than AI.

7 By contrast, presence of a specific ABO factor as a result of a "direct" testing method such as AE is indicated by observation of agglutination in a test well.

reagent containing a pre-determined dilution of the appropriate antibody is added to each tube to enable the antibody to incubate with the secretion stain. Each tube contains one of three antibody dilutions -- either anti-A, anti-B, or "anti-O."[8]

If the corresponding antigen is present in the questioned stain, the strength of the antibody remaining in the solution will be diminished as the antibody becomes bound to the corresponding antigen by forming an antigen-antibody complex. The serologist then removes the residual antibody solution from each tube and places these residual solutions on a glass plate or glass slide, which is tested with a freshly prepared suspension of the corresponding commercially-available, known ABO cells. The three residual solutions are mixed with known ABO type A cells, type B cells, and type O cells. Because AI is a form of "reverse" testing, the presence of agglutination in the test slide for a particular antigen indicates that the corresponding ABO factor is *not* present in the secretion stain being tested. For example, the absence of agglutination in the antibody solution mixed with type A cells indicates the presence of type A activity in the secretion sample.

---

8 Because there is no common human antibody against ABO type O blood cells, scientists use an extract from gorse seeds, *Ulex Europeus*, to cause type O cells to agglutinate. The seed extract, called "lectin," agglutinates the H antigen found on all ABO cells, but the agglutination occurs in much higher concentration in the presence of type O cells. Thus, the term "anti-H" seed lectin has become synonymous with "anti-O" for purposes of ABO testing.

Appendix C

Discussion of DNA Profiling Technology and Techniques Used by the Crime Lab

RFLP Testing

Testing of restriction fragment length polymorphisms ("RFLPs") involves the analysis of DNA fragments that are produced by using restriction enzymes, which act like scissors to cut DNA into fragments at specific locations. These DNA fragments of different lengths, also known as alleles, are distinguishable from each other in human populations. Hence, the genetic variation that RFLP identifies is known as "length polymorphism."[1]

Once DNA molecules have been cut into pieces by restriction enzymes, the resulting fragment lengths are separated through a process known as gel "electrophoresis."[2] During the electrophoretic process, DNA fragments migrate through gel, with the smaller DNA fragments moving at a faster rate than the larger DNA fragments. It is the results of this migration process that enable the forensic DNA analyst to distinguish between fragment sizes of DNA.

One of the critical steps in the RFLP process that must be performed correctly in order to generate reliable test results is the loading of DNA samples into the electrophoretic gel. The DNA analyst must deliver the solution containing DNA samples into the appropriate hole (or well) located on the gel-coated plate. This is accomplished by lowering the tip of the pipette containing the DNA sample into the buffer solution in which the gel is submerged and ejecting the DNA sample above the well in order to permit the DNA extract to flow into the well. Because each well has a limited capacity, the DNA analyst must take care not to overfill a well. This precise process of loading of DNA samples requires training, patience, and skill to avoid contamination as a result of crossover of the DNA extract into one or more adjacent wells.

In order to avoid the potential for such contamination, which might cause a "false positive" typing result, it is critical that the DNA analyst avoid placing DNA

---

1 Another form of forensic DNA testing that involves the identification of genetic variation attributable to length polymorphism is the testing for short tandem repeats ("STRs") of DNA markers. By contrast, other types of DNA testing are used to detect differences in individual nucleotides or base pairs, rather than DNA fragment length, which is a form of genetic variation known as "single-nucleotide polymorphism" or "SNP." PCR-based DQ Alpha and Polymarker ("PM") testing, discussed below, are examples of SNPs used in forensic applications.

2 Electrophoresis is a technique that separates molecules based on their size and charge.

extracted from evidence taken from a crime scene in a well immediately adjacent to a DNA sample extracted from a known reference sample taken from a victim or a suspect. The generally accepted forensic science practice to reduce the risk of crossover contamination and the potential for a "false positive" resulting from a mistake in the gel loading process is for the analyst to leave an empty well between a questioned sample and a known reference sample. In this way, any adventitious appearance of a DNA profile in the empty lane (or control lane) between a question sample and the reference sample will signal that a contamination event has occurred and that the analyst must take appropriate remedial action.

Once the electrophoretic process in complete, the DNA analyst then transfers the separated DNA fragments from the electrophoretic gel to a permeable nylon membrane through a technique known as "Southern blotting." The DNA fragments are then chemically bound to the membrane to allow the results of the electrophoretic separation of the fragments to be visualized through a radioactive or chemiluminescent process.

To visualize the patterns generated by the electrophoretic process, DNA fragments bound to the nylon membrane are made radioactive or chemically active through the use of commercially-available "probes," a process known as "hybridization."[3] The membranes are then placed in close contact with x-ray film, which is exposed at very cold temperatures for periods of time ranging from hours to weeks. The lab analyst then develops the x-ray film in order to reveal the images of the radioactive or chemically labeled DNA allele fragments. These x-ray film images, known as "autoradiographs" or "autorads," appear as clear films with dark bands on them. The DNA analyst determines the size of each band by comparison with known sizing standards. The size of the evidence fragments is compared to those in the known reference samples.

Sometimes the banding patterns can appear too faintly for reliable interpretation of the RFLP alleles. When that occurs, it is necessary to take steps to try to enhance those results. Short of retesting the sample again from the beginning and using a larger volume of sample, a better option is to expose a second film for a longer period of time. This allows the analyst to call faint bands with higher confidence.[4]

---

[3] These radioactively or chemically labeled probes are fragments of DNA of known molecular structure and containing a base sequence complementary to the RFLPs being identified.

[4] It is important to note that stripping the membrane of probes and re-hybridizing with fresh probes eventually will lead to a reduction in the amount of DNA bound to the membrane.

Appendix C

Early PCR-Based Testing

The polymerase chain reaction ("PCR") process, developed by Dr. Kerry Mullis in the mid-1980s, revolutionized molecular biology by providing scientists the means to replicate (or amplify), very rapidly, incredibly small amounts of DNA up to a billion-fold. PCR's impact on forensic DNA analysis was particularly significant because it enabled forensic scientists to perform meaningful testing on evidentiary samples of DNA that would have been too degraded or too low in quantity. PCR-based testing also has the advantage of providing much faster turnaround time than RFLP testing. A forensic DNA laboratory can complete most PCR testing in a matter of days -- a significant improvement over the months it could take to complete RFLP testing.

One drawback of forensic PCR technology is that it is extremely susceptible to contamination by extraneous DNA from other sources, including other evidence items, investigators who collected the evidence, and the forensic DNA analysts themselves. Although the use of proper standards and controls can most often signal any contamination events that occur in the laboratory, it still requires proper training, compliance with strict quality control procedures, and diligence to avoid contamination during the analysis of forensic DNA testing samples. That is one of the reasons why strict compliance with proper SOPs, adequate training, close supervision, and mandatory standards and controls are so critical to achieve accurate and reliable DNA test results.

PCR technology is a patented process which is very closely regulated through licenses from the patent holders. Consequently, virtually all of the test reagent kits used in crime laboratories are sold by a limited number of vendors who confer the licensing rights to use PCR for forensic applications with the purchase of the kits. The advantage is that high quality kits with consistently high performance characteristics are available to all forensic laboratories throughout the industry. This allows standardization of the loci, the kits, and the procedures across the entire forensic DNA testing community.

A. DQ Alpha

DQ Alpha (also know as "DQα" and later "DQA1") refers to a gene located in the human leukocyte antigen ("HLA") complex on the short arm of the sixth chromosome in humans. In the late 1980s, the AmpliType™ HLA DQα Forensic DNA Amplification and Typing Kit was introduced to forensic laboratories. The kit distinguished six alleles or genetic variants at the DQA1 locus, which defined a total of 21 different genotypes. The kit format was known as "reverse dot blot" that came in the form of a probe strip containing a series of test dots. The actual DQα typing assay involves three stages: (1) DNA extraction; (2) DNA amplification through the PCR

process; and (3) the DNA typing process, which includes de-naturation of the amplified DQα product, hybridization of the evidentiary and known reference DNA samples to probe strips, stringent washing of the probe strips in solution, and, finally, interpretation of the color development appearing in the dots contained on the test strip.

Specifically, DNA probes are immobilized onto a nylon typing strip in a pattern of a series of dots. During the hybridization step of the DQ Alpha typing process, amplified DQα DNA from the test samples are captured by these probes and retained on the typing strip. During the stringent washing stage of the process, only those DQα alleles that are sufficiently well matched to the DNA sequences contained on the probes will remain attached to the probe strip. The amplified DQα DNA retained on the strip is then visualized by color development in the dots contained on the DQ Alpha test strip. The DNA analyst interprets the DQ Alpha test results by reading the pattern of blue dots on the probe strips in order to determine which DQα alleles are present in the DNA sample being tested.[5]

An important feature of the DQ Alpha typing kit is the control (or "C") dot placed on the probe strip. The C dot serves two functions. First, the C dot indicates whether adequate amplification and typing of the DQα alleles has been achieved in a given test. Second, the C dot guides the DNA analyst in the typing of DNA samples potentially comprised of a mixture of DNA from more than one donor or containing DQα subtypes not identified by the test strip. The manufacturer of the DQ Alpha testing kit designed the C dot to be the weakest spot on the strip in terms of visualization, thereby providing a threshold for the interpretation of the allelic dots on the DQ Alpha test strip. For example, if, after the washing process, the C dot is not visible, then no results on the test strip should be interpreted and typed because the results obtained on the allelic dots are below the threshold for reliable interpretation. Moreover, the DNA analyst should interpret the dots exhibiting a signal intensity that is less than the C dot with caution because this might indicate the presence of a mixed DNA sample, a procedural error such as improper washing, cross-hybridization, or contamination of the DNA sample.

In addition, controls such as a reagent blank, a negative DNA control, and a positive control must be included with each assay of the DQ Alpha test strips. The

---

5 DNA analysts should interpret DQ Alpha results by reading the freshly developed test strip. The analyst should also take photographs that are of large enough size and sufficient clarity to be examined for subsequent interpretation and maintain such photographs as a permanent part of the case file.

reagent blank is a check for possible contamination of the sample preparation reagents by other human DNA or by amplified DQα DNA. The reagent blank is performed by carrying out the DNA extraction in a tube containing no sample or on a sterile substrate (e.g., a swab or piece of fabric). This reagent blank extract is then amplified and typed along with the test samples. The negative control is a check for contamination during the set up of the PCR reaction. If typing signals appear in the negative control, every effort should be made to locate the possible sources of contamination. Under no circumstances should the reagent blank control or the negative control show a positive signal. If these controls happen to show signal, the affected samples must be interpreted and should be re-tested. Finally, a positive control is provided as part of the DQ Alpha test kit and should be used with each amplification and hybridization to demonstrate that the kit is performing properly. If the DQ Alpha type of the positive control is not correct, the DNA analyst should re-test the affected case samples. The DNA analyst should take photographs of all control wet strips -- i.e., the reagent blank, negative control, and positive control -- and these photographs should be maintained as a permanent part of each case file.

B. Polymarker

Following the release of the DQ Alpha typing kit came the development and release of the AmpliType PM PCR Amplification and Typing Kit, also known as "Polymarker." The Polymarker test kit allows for the simultaneous amplification of five specific genetic locations (or "loci"): Low Density Lipoprotein Receptor (LDLR), Glycophorin A (GYPA), Hemoglobin G Gammaglobin (HBGG), D7S8, and Group Specific Component (GC).[6] The Polymarker kit contains detection reagents and DNA probe strips for typing the LDLR, GYPA, HBGG, D7S8, and GC loci by using the same reverse dot blot format and process as the DQ Alpha test process -- i.e., PCR amplification, hybridization, washing, visualization, and interpretation.

Under appropriate hybridization conditions, amplified DNA products containing the alleles designated on the probe strip will bind specifically to a particular dot on the Polymarker test strip. The AmpliType PM test system includes a standard probe dot (the "S" dot) that serves the identical quality control functions as the C dot on the DQ Alpha typing strips. In reading a Polymarker test strip, a DNA analyst should not type any of the five loci on the test strip if the S dot is not visible and should interpret any dots on the test strip that are lighter in color than the S dot with caution.

---

6 These genetic markers, as well DQα, are inherited independently, thus allowing the genotype frequencies to be multiplied in order to determine the frequency of occurrence for a particular genetic profile in a specific population of humans.

Appendix C

C. D1S80

The D1S80 locus is found in the non-coding region of the first chromosome.[7] Since it was first characterized in 1988, the D1S80 locus has been widely used in forensic analysis because it shows a very high degree of polymorphism. For example, most individuals have alleles at the D1S80 locus containing between 14 and 40 tandem repeats. The observed variability in the combination of alleles ("heterozygosity") at this locus has been reported to be as high as 87.6%. Due to the large number of alleles associated with the D1S80 typing system, it is highly discriminating and is frequently a more effective system for the analysis of mixed samples than the DQ Alpha or Polymarker systems.

A DNA analyst assays the number of tandem repeats possessed by an individual at the D1S80 locus by running PCR-amplified DNA products through an electrophoretic process. D1S80 allelic bands are then visualized and photographed. Similar to the RFLP process, larger fragments of DNA (those containing more tandem repeats) run slower through the gel and can be observed toward the top of the gel, while smaller fragments (those containing fewer tandem repeats) run more quickly through the gel. Sizing ladders are run on the gel to determine the alleles present in each sample. D1S80 alleles are expressed as the number of repeats in each DNA fragment. For example, one individual might be typed for D1S80 as 18,24 (18 repeats and 24 repeats) and another as 22,31.

STRs

Today, short tandem repeats ("STRs") are the genetic markers most widely used by crime laboratories to type biological evidence samples. STR technology is fast, sensitive, and highly discriminating.

In principle, STR markers are very similar to the DNA markers used in RFLP and D1S80 typing: They are DNA fragments composed of a number of DNA units and vary in size from one person to the next. STR markers are particularly useful in typing biological samples that are old or degraded because the DNA fragments used in STR typing are relatively small compared to the DNA fragments analyzed in RFLP or D1S80 testing. STR typing incorporates the use of PCR amplification and, therefore, is very

---

7 More than 30% of the human genome is largely composed of repeating segments of DNA that seem to act as fillers or spacers between the coding regions of DNA on chromosomes. Although these repeating segments of DNA do not control any genetic function, they, nevertheless, are an inherited component of an individual's genetic makeup.

sensitive and capable of producing DNA typing results from small amounts of biological evidence.

During the PCR amplification process, fluorescent dyes are incorporated into the DNA fragments. After the PCR process, DNA fragments then are transferred to a gel matrix and separated by size using electrophoresis. This electrophoretic step can be conducted on a variety of instruments, such as a DNA sequencer. These instruments detect the DNA fragments through the use of the fluorescent dyes attached to the DNA fragments. The advantage of this fluorescent dye detection strategy is that it allows "multiplexing," which is a technique that simultaneously detects multiple STR loci in a single analysis. Because multiplexing allows for several STR loci to be analyzed in a single tube, STR technology is considered a relatively fast method that delivers very discriminating results.

As the DNA fragments migrate through the gel matrix and into the instrument's detection window, the fluorescent tags attached to the fragments give off a signal that is captured by the instrument as a "peak" detected at a particular point in time in the analysis process. Through the application of sophisticated software, the instrument is capable of converting the time the DNA peak was detected into a fragment size and then into a DNA type. This typing information can be recorded on a printout known as an "electropherogram." Similar to the results generated by D1S80 testing, allele types developed through STR analysis typically are expressed as numbers. For example, at the "D3" STR locus the DNA sample for an individual could be typed as a "16, 18" type. The analyst then compiles all of the allelic typing information developed at multiple STR loci to produce a complete STR profile of known reference samples as well as the evidentiary samples recovered from crime scene.

Since STR typing is based upon a PCR platform, in order to obtain reliable and accurate STR results, it is essential that DNA analysts handle all biological samples appropriately so that the chance of sample mix-up or contamination is minimized. In part, this means that appropriate positive and negative controls must be used throughout the STR typing process. DNA analysts must monitor the performance of all controls to minimize the chance of error and to assess the testing process. In addition to the positive and negative controls, the analyst should also take advantage of features that are engineered into the STR reagent kits. For example, when used in conjunction with each other, the "Profiler Plus" and "COfiler" reagent kits used by the Crime Lab have a built-in redundancy at three loci -- D3S1358 ("D3"), D7S820 ("D7"), and amelogenin.[8] The presence of these redundant STR loci is a control to detect possible

---

8 The "COfiler" and "Profiler Plus" STR kits are proprietary products of Applied Biosystems.

Appendix C

sample switches or poor sample quality. If the typing results at the three redundant loci obtained by both the "Profiler Plus" and "COfiler" kits are not concordant, the analyst should be alerted to a problem that must be resolved.

Appendix D

SEROLOGY MAJOR ISSUE DEATH PENALTY CASES

Alexander, Guy L89-00956
Anderson, Larry Norman L82-02512 (Executed)
Bunion, Carl L90-06794
Campbell, Robert L91-00532
Crank, Denton Alan L84-00721 (Executed)
Derrick, Mikel James L80-07461 (Executed)
Drinkard, Richard Gerry L85-11525 (Executed)
Goynes, Theodore L90-10660
Jackson, Derrick L88-08130
Mccoy, Stephen L81-00020 & L80-08451 (Executed)
Meanes, James Ronald L81-02975 (Executed)
Motley, Jeffrey Dean L84-08158 (Executed)
Nelson, Marlon L87-08413
Ransom, Kenneth Ray L83-05785 (Executed)
Rhoades, Rick L91-09937
Santana, Carlos L81-02975 (Executed)
Sawyers, John C. L83-01302 (Executed)
Shore, Anthony L92-04687
Simms, Demetrius Lott L91-06681
Smith, Clyde Jr. L92-01604 (Executed)
Smith, James Edward L83-01901 (Executed)
Tennard, Robert James L85-08269
Tucker, Karla Faye L83-05252 (Executed)
Wilkerson, Richard James L83-05785 (Executed)

SEROLOGY MAJOR ISSUE CASES

Abbs, Kenneth W. L83-01332
Airington, Larry Duane L84-01505 & L84-01904
Aparicio, Jesus L87-06849
Armstrong, Craig Anthony L83-01795
Arnold, Edwin Gene L83-01328
Authorlee, Carlos Miguel L90-06462
Ayarzagoitia, Porfiro L89-04353
Barker, Phillip Newton L85-07735
Barton, Willie L87-02871
Bender, Charles David L83-11411 & L84-01437
Benjamin, Ricky L87-11861
Benthall, Kenneth Neil L82-10620

Appendix D

Benton, Tommy L90-00855
Berrera, Galvino Perales L88-02504
Bishop, Gregory L90-03002
Block, Gerald Bernard L86-01480
Boyd, David Louis L83-07288
Brashar, Michael Blane L82-05639
Briscoe, Herbert L88-07531
Briscoe, Jamie L88-07531
Brogdon, Ron Lynn L82-10620
Brooks, John Daniel L81-01229
Brooks, Robert Lee Jr. L82-06322
Brooks, Stephen L82-02274 & L82-02606
Brown, James Martin L86-10190
Brown, Kenneth James L81-05350
Brown, Robert L87-02402
Bruno, Howard Joeseph L90-09806
Burdine, Calvin Jerold L83-03407 & L83-03412
Burkett, Harold L89-01678
Burnett, William L89-10654
Camarena, Carlos L88-05490
Campos-Garcia, Jose L91-10133
Carr, Eric L91-04115
Carr, William Marion L82-02863
Carroll, Roosevelt L87-04935
Casey, Charles Lee L83-05986
Casiano, Herman Gomez L85-02149
Castellano, Andy L89-09783
Chatman, Ray L88-00099
Clark, Ira Craig L85-09472
Clark, Tyrandy Dewayne L84-09626
Cloud, Sammy L91-01367 & L91-01586
Coffey, Raymond L86-04475
Coleman, Melvin L81-08410
Coleman, Michael L88-03167, L88-09376, L88-09377, & L88-09378
Coleman, Michael L89-11985 & L89-12260
Collins, Joe C. L84-03065
Cosmi, Traian Daniel L88-05490
Cravey, Michael Gene L85-08909
Culton, Alan Enrique L86-05694 & L86-10642
Davis, Dennis L88-05005
Davis, Ernest Lovell L83-10054

Appendix D

Davis, Greg Hoppe L84-10080
Delagarza, John Albert L91-06195
Delgado, Anselmo Silva L91-00266
Diaz, Gilbert L83-11490
Doria, Javier L89-02735
Draughon, Martin Allen L86-10824
Dykes, Ricket Lee L84-05919
Eden, Calvin Bernard L83-07211
Eitel, Ronald Dale L82-01958, L82-02037, L82-03681, & L82-03720
Ellis, Eugene (Alias - Thomas, James) L93-00499
Fairlie, Scott L83-00540
Figueroa, Steve Wayne L84-09090
Flores, Frank L82-08263
Francis, Leonard L86-06801
Fuentes, David L90-11823
Gaddy, Kenneth Michael L87-11254
Garcia, Clemente L80-05005
Garcia, Eleazar L80-04725
Garner, Edwin L87-10674
Garrett, Larry Jerome L84-13920
Gelabert, Ana Lucia L84-00100
Gibbs, Marvin Lynn L84-04881
Gillum, William L88-00332
Gilpin, Terry L89-10763
Gilson, Robert Anthony O'shane L81-02737
Gomez, Fermin Diaz L89-09747
Gonzales, Frank L90-09804
Gonzales, Joseph L87-11261
Gonzales, Russell Ray L85-05973 & L85-05308
Goynes, Thedore L89-01224
Grant, John Brandel L84-05838 & L83-09513
Grimes, James L91-10235
Groom, Daniel L85-08269
Guerra, Armand L87-06353
Hairrell, Gordon L86-09235
Hall, Derrick Demieth L83-07514 & L83-07473
Hall, William Arnal L85-11402
Hancock, William L88-02052
Hayward, Victor L90-05973
Helfond, David Scott L83-01796
Hillsman, Larosia Cartez L81-06045

Appendix D

Hodge, Charles L86-10546
Holmes, Edward L91-03853
Hughes, Preston L85-05420
Ireland, Charles Franklin L88-06846
Jackson, John Henry L85-03232
Jackson, Norman L89-06057
Jackson, Willie Earl Jr L82-01682
Jackson, Willie Gerard L89-05545
Jacobs, Wilbert L84-09119
James, Lonnie L90-01515 & L90-01852
Johnson, Dimitrius L84-09626
Jones, Rory Keith L82-06545, L82-07745, & L82-09034
Kelley, Donald Wayne L92-03494
Knotts, Joseph Alexander L84-11933 & L84-11938
Leblanc, Perry L89-10423
Lewis, Leroy L91-00532
Lewis, Thomas Curtis L84-09330
Luken, Danny Joseph L86-03501
Luna, Jose L90-02094
Luss, Donald L90-03601
Mangis, Troy Wayne L87-02602
Mao, Benjamin L86-06801
Martin, Steve L87-07876
Martinez, Guellermo L90-08288
Matson, John Dee Jr. L85-05301& L85-06750
Maxie, Elaine Ellis L84-10901
Mays, Sammie L89-07713
Mccoy, Stephen L80-08451 & L81-00020
Mcdonald, Rudolph L86-02148
Mcfarland, Terry Lynn L83-08410
Mcgee, Elvis L89-12840
Mckinney, Clifton Andre L81-08897
Medina, Arthur L84-10082
Miller, Eugene L82-06514
Miller, Roy Michael L80-05462
Morales, Manuel L88-01830
More, Don Khan L86-11084
More, Kenneth Bradley L81-02544
Morrison, Bobby L88-00540
Morrison, Charles L89-09453
Morrison, Jamie L91-03853

Appendix D

Murphy, Christopher L86-04474
Murphy, Donald Lee L84-09330
Napper, Lawrence James L81-02529
Ned, Michael Anthony L86-09236
Norris, Alphonse Jr L85-02557
Nubine, Clyde L84-07757
Offord, Timothy L90-10291
Overstreet, Willie L84-07021
Pacholsky, Charles L89-04795
Paster, James Emery L80-08451 & L81-00020
Patrick, Monte L89-10420
Pena, Armando L84-05198 & L84-05227
Person, Carlton L90-11819
Phillips, Michael L88-02292
Pierce, Danny L L84-03890
Qualls, Roy Anthony L89-07064
Ramirez, Carlos L85-09277, L85-09298, & L85-09229
Randall, James Edward L83-05785
Randall, Paul L80-04956
Reed, Eric Antoine L82-02274 & L82-02606
Richard, Gary Alvin L87-00797
Riser, Dwight L87-07602
Rodriguez, George L87-02120
Rodriquez, Henry L91-06195
Romar, Richard Junior L81-09513 & L81-09566
Ross, Jerry L89-09227
Rylander, Richard L91-12377
Salazar, Roland L90-08015
Salinas, Miguel L90-07636
Samuel, Michael L90-10523
Sanchez, Joe L87-03227
Sanchez, Miguel Angel L84-11057
Segura, Sergio L91-07450
Shultz, Jr. Aubrey Dale L91-01066
Simon, Wendell Earl L85-07162
Simpson, Charles L90-09770
Singleton, Cedric Anthony L84-05758
Smith, Kenyon L91-03853
Sonnier, Earnest Lee L85-12939
Spring, Daniel Livingston L86-00955
Stevenson, Luttrell L80-06114

Appendix D

Stokes, Forrest L90-05132
Strom, Arling Michael L88-08249
Thibodeaux, Walter Joseph L84-00272
Thomas, Earl L93-04349
Thomas, Richard L89-08983
Thompson, Carlton Eddie L84-11933 & L84-11938
Toliver, August L90-12339
Trevino, Albert L87-11554
Turk, Howard Edward L85-12144
Tyler, Patrick D. L87-00752
Tyler, Patrick Joseph L90-07422
Unknown L88-01139
Unknown L88-04309
Valle, Adam L92-06087
Vargas, Espiridion L89-10583
Vela, Rubin C L82-07400
Walker, Robert L88-02292
Warner, John L89-06435
Warren, Jimmy L91-09146
Washington, Gary Lynn L85-07358
Washington, Janice Faye L85-04673
Weaver, Thomas L91-08957
Williams, Billy L91-06342
Williams, Joanne L90-09703
Williams, Joseph L80-01135
Wilson, Dennis James L85-08795
Wilson, Pete Jr. L91-03245
Wyatt, Clarence L88-00099
Wynn, Barry Lee L85-12152

Appendix E

DNA Major Issue Cases

Alix, Franklin L97-12163
Alvarez, Juan Carlos L98-07378
Boudreaux, Raymon L97-00568
Cantrell, Ronald L01-17322
Carter, Harold L94-02461
Davis, Garland L93-10985
Emory, Gregory L96-05918
Garcia, Luis L98-09736
Gonzales, Jose James L93-12489
Guevara, Gilmar L00-08053
Guevara, Luis/Fernandez, Sixto L00-13216
Harris, Erskin L95-08229
Hayden, Robert L94-01695
House, Dillard L00-02780
Jackson, Derrick L88-08130
Jackson, Reginald L97-12636
James, Leon L94-05670
Johnson, Arthur L97-00479
Lawson, David L96-03366
Lewis, Leroy L91-00532
Lewis, Roger L93-02191
Lopez, Segundo L97-12346
Meza, Alfredo L95-10460
Mingo, Michael L97-13990
Napper, Laurence L01-02205
Nugent, Hermann L93-12224
Parra, Carlos L97-05353
Pineda, Johnny L94-06976
Preston, Terrance L00-01952
Rayson, Carl Lee L96-13604
Samuels, Michael L95-13955
Segura, Carlos/Zavala, Mark L98-11877
Shields, Robert L94-10028
Smith, Charles Leon L84-08387
Southern, Ronnie L95-03891
Sutton, Josiah L98-13476
Valdez, Richard L96-05919
Vanzandt, Lonnie L94-12745
Vaughn, Artice L94-11539

Appendix E

Ware, Cory L02-04949
Ware, Marshall L95-05151
Washington, Dedrick L95-00745
Zelaya, Alberto L95-08103

Appendix F

ACRONYMS

AE	absorption elution
AFIS	Automated Fingerprint Identification System
AFQAM	Association of Forensic Quality Assurance Managers
AFT	Bureau of Alcohol, Tobacco, Firearms and Explosives
AI	absorption inhibition
AP	acid phosphatase
ASCLD	American Society of Crime Laboratory Directors
ASCLD/LAB	American Society of Crime Laboratory Directors/Laboratory Accreditation Board
BAS	Bloodstain Analysis System
CAP	College of American Pathologists
CER	Central Evidence Receiving
City	The City of Houston, Texas
CODIS	Combined DNA Index System
CSU	Crime Scene Unit
DAB	DNA Advisory Board
DNA	deoxyribonucleic acid
DPS	Department of Public Safety
EAP	erythrocyte acid phosphatase
EsD	estrase D 1
FBI	Federal Bureau of Investigation
FPIA	fluorescence polarization immunoassay
FTIR	Fourier Transform Infrared

Appendix F

GC/MS	gas chromatograph/mass spectrometer
GHB	Gamma Hydroxybutyrate
GPS	global positioning system
GRC	general rifling characteristic
HLA	human leukocyte antigen
HP	haptoglobin
HPD	Houston Police Department
IAD	Internal Affairs Division
IBIS	Integrated Ballistics Imaging System
LIMS	laboratory information management system
ME's	Medical Examiner's
MSP	Michigan State Police
NFSTC	National Forensic Science Technology Center
OLO	On-line Offense
PCP	Phencyclidine
PCR	polymerase chain reaction
PGM	phosphoglucomutase
PM	Polymarker
PwC	PricewaterhouseCoopers LLP
QA/QC	quality assurance andquality control
RFID	radio frequency identification
RFLP	restriction fragment length polymorphism
RFP	Request for Proposals
rfu	relative fluorescent units

Appendix F

RMS	records management system
SANE	sexual assault nurse examiner
SERI	Serological Research Institute
SNP	single-nucleotide polymorphism
SOP	standard operating procedure
STR	short tandem repeat
SWAFDE	Southwestern Association of Forensic Document Examiners
TLC	thin layer chromatography
UCR	uniform crime reporting