I. BACKGROUND

A. History of the Texas Forensic Science Commission

In May 2005, the Texas Legislature created the Texas Forensic Science Commission ("FSC" or "Commission") by passing House Bill 1068 (the "Act"). The Act amended the Code of Criminal Procedure to add Article 38.01, which describes the composition and authority of the FSC. *See* Act of May 30, 2005, 79th Leg., R.S., ch. 1224, § 1, 2005. The Act took effect on September 1, 2005. *Id.* at § 23.

The Act provides that the FSC "shall investigate, in a timely manner, any allegation of professional negligence or misconduct that would substantially affect the integrity of the results of a forensic analysis conducted by an accredited laboratory, facility or entity." TEX. CODE CRIM. PROC. art. 38.01 § 4(a)(3).

The term "forensic analysis" is defined as a medical, chemical, toxicological, ballistic, or other examination or test performed on physical evidence, including DNA evidence, for the purpose of determining the connection of the evidence to a criminal action. *Id.* at art. 38.35(4). The statute specifically excludes certain types of analyses from the "forensic analysis" definition, such as latent fingerprint examinations, a breath test specimen, and the portion of an autopsy conducted by a medical examiner or licensed physician.[1]

The FSC has nine members—four appointed by the Governor, three by the Lieutenant Governor and two by the Attorney General. *Id.* at art. 38.01 § 3. Seven of the nine Commissioners are scientists and two are attorneys (one

[1] For list of statutory exclusions, *see* TEX. CODE CRIM. PROC. art. 38.35(a)(4)(A)-(F) & (f).

prosecutor and one criminal defense attorney). *Id.* The FSC's presiding officer is designated by the Governor. *Id.* at § 3(c).

The FSC's policies and procedures set forth the process by which it determines whether to accept a complaint, as well as the process used to conduct an investigation once a complaint is accepted. *See* FSC Policies & Procedures at § 3.0, 4.0. The ultimate result of an investigation is the issuance of a final report.

B. National Context

With the FSC's creation, Texas emerged as a leader among states seeking to advance the integrity and reliability of forensic science in criminal courts. Texas is one of only a handful of states to establish an independent agency for forensic oversight of accredited criminal forensic laboratories. Since 2005, the Commission has worked to meet the challenges inherent in building an agency from scratch with limited guidance and no pre-existing model. The FSC operated without funding for two consecutive bienniums; it hired its first staff member (the commission coordinator) in June 2008 and a second (the general counsel) in December 2010. From its inception, the Commission has been in the unusual position of developing standards to govern its own internal processes while simultaneously holding other agencies accountable for theirs. The Commission anticipates that other states will look to Texas and its peers as models for developing similar forensic oversight commissions.

Current interest in improving forensic science at the national level was prompted in part by the release of a 2009 National Academy of Sciences report entitled *Strengthening Forensic Science in the United States: A Path Forward*

(the "NAS Report").[2] The NAS Report contains thirteen recommendations designed to improve forensic science and establish consistency and predictability. It addresses fire science briefly in a section entitled "Analysis of Explosives Evidence and Fire Debris." (NAS Report at 170-173.) The Commission incorporates observations from the NAS Report herein to the extent such information is relevant and useful.

C. Intersection of Science and the Law

As the United States Supreme Court noted in its landmark decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.,* 509 U.S. 579 (1993) ". . . there are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly." *Id.* at 596-97. Despite these differences, scientists, lawyers and judges must work together to fulfill their respective roles in the legal system. While judges and lawyers have some exposure to forensic science, they often lack the expertise necessary to thoroughly evaluate the reliability of forensic techniques. (NAS Report at 85.) This places tremendous pressure on the forensic science community to engage in continuous internal evaluation of forensic disciplines and to strive for consistent application of modern scientific principles in the courtroom. *Id.* at 110.

In this report, the Commission offers recommendations specific to the forensic discipline of fire investigation, with the goal of encouraging the

[2] For a copy of the NAS Report, *see* http://www.nap.edu/catalog.php?record_id=12589.

consistent application of modern fire science principles. The Commission notes that fire investigation, like many forensic disciplines, requires the exercise of judgment by individual investigators. For example, as NFPA 921 states in its discussion of origin determination, "ultimately, the decision as to the level of certainty in data collected in the investigation or of any hypothesis drawn from an analysis of the data rests with the investigator." (NFPA 2008 edition at 18.6.2.) Reasonable minds can differ on interpretive issues, and disagreements will occur among forensic experts, including fire investigators. However, such disagreements must be based on a shared knowledge of modern fire science and the proper application of the scientific method as described in NFPA 921. Ongoing training, effective dissemination of information regarding advances in fire science, and an environment that encourages honest dialogue among stakeholders are critical to achieving this goal.

II. PENDING JURISDICTIONAL ISSUES

Since its creation in September 2005, the FSC has received numerous investigative requests involving various types of forensic analyses, some of which were conducted years or decades ago. Because the FSC's enabling statute provides limited detail regarding the scope of its jurisdiction, some interested parties have questioned the reach of the FSC's investigative authority. For example, during the course of this particular investigation, both the Corsicana Fire Department ("CFD") and State Fire Marshall's Office ("SFMO") challenged the FSC's jurisdiction on the following grounds: (1) the complaint involves facts that pre-date the existence of the FSC and the statewide process for accreditation of

laboratories, facilities or entities that test evidence for presentation in criminal courts; (2) the Act's effective date language limits the FSC's jurisdiction over evidence tested before September 2005; and (3) the complaint involves the forensic discipline of fire investigation, which does not fall within the applicable statutory definition of a "forensic analysis conducted by an accredited laboratory, facility or entity."

In light of these jurisdictional questions and the related risk of litigation, the Commission voted at its January 21, 2011 quarterly meeting to obtain an official legal opinion from the Texas Attorney General's Office (*see* Exhibit 1 for copy of request). The FSC anticipates that ambiguities and conflicts over jurisdictional issues will be addressed by the Attorney General's office in its response to the pending request. Legislative amendments during the 82nd Session may also provide additional clarification.

III. SCOPE OF THE REPORT

The Commission understands the importance of issuing a report that provides substantive recommendations designed to improve arson investigation in Texas. In light of the jurisdictional issues discussed above and related litigation concerns, the Commission declines to issue any finding regarding negligence or professional misconduct pending the issuance of an Attorney General opinion and/or legislative action during the 82nd Session. However, the FSC realizes that there is great public interest in the resolution of the combined Willis/Willingham investigation ("Investigation"), especially to the extent that a resolution will contribute to the ongoing development of fire investigation in Texas. This report

sets forth the FSC's observations regarding the history and progress of fire science, including incendiary indicators and related investigative issues. It takes a forward-looking approach, suggesting concrete training and educational initiatives. Observations regarding the state of fire science and suggestions for continued advancement are not limited to the Willingham and Willis cases, but rather apply generally to arson investigations in Texas.

This Investigation has also revealed the practical difficulties of conducting a negligence review for a case in which there is a significant gap in time between the FSC's consideration of the complaint and the point at which the original forensic analysis was conducted. Both fires occurred at least two decades ago. The substantial passage of time, limited record and the unavailability of at least one of the original fire investigators all add to the difficulty of conducting a thorough review.

Some Commissioners have also noted that the Willingham case has posed a particular challenge due to the controversy surrounding the death penalty. The FSC was not established as a commission for establishing innocence or guilt, nor was it established as a forum for debating the merits of capital punishment. It was established to advance the reliability and integrity of forensic science in Texas courts. As the Texas Court of Criminal Appeals noted in a recent decision, criticism concerning the potential for wrongful execution is an important moral and public policy question, suitable for intense and open debate by legislative policymakers. *State ex. rel. Lykos v. Fine*, Nos. AP-76,470 and AP-76,471 at 25 (Tex. Crim. App. Jan. 12, 2011). "Neither trial judges nor judges on this Court sit

as a moral authority over the appropriateness of the death penalty." *Id.* The FSC notes that the same observation applies to its role in the Willingham case.

No finding contained herein constitutes a comment upon the guilt or innocence of any individual. A final report by the FSC is not prima facie evidence of the information or findings contained in the report. TEX. CODE CRIM. PROC. art. 38.01 § 4 (e); FSC Policies and Procedures § 4.0 (d). The Commission does not currently have enforcement or rulemaking authority under its statute. The information it receives during the course of any investigation is largely dependent upon the willingness of concerned parties to submit relevant documents and respond to questions posed. The information gathered has not been subjected to the standards for admission of evidence in a courtroom. For example, no individual testified under oath, was limited by either the Texas or Federal Rules of Evidence (*e.g.,* against the admission of hearsay) or was subjected to formal cross-examination under the supervision of a judge. Therefore, this report does not serve as a document necessarily admissible in court for any civil or criminal purpose. Rather, it seeks to encourage the development of forensic science in Texas, particularly in the area of fire investigation.

IV. COMPLAINT BACKGROUND

On August 13, 2008, the Innocence Project ("IP") filed a formal complaint with the FSC alleging professional negligence and/or misconduct in the course of the arson investigations and testimony given at the trials of Cameron Todd Willingham in 1991 and Ernest Ray Willis in 1987. (*See* Exhibit 2)

The FSC began its investigation by soliciting initial responses from the CFD and SFMO (*See* Exhibits 3 & 4). Both agencies submitted responses. (*See* Exhibits 5 & 6). The Commission also contracted for the professional opinion of fire scientist Craig L. Beyler, Ph.D. Beyler's final report is attached (*See* Exhibit 7). Dr. Beyler was given a cd-rom of documents provided by the Complainant and photographs of the crime scene, along with other documents received from the SFMO. (*See* Exhibit 8 for list of documents.)

In addition to Beyler's report, the FSC solicited written comments from independent fire science expert John DeHaan, Ph.D. and Houston Police Department fire investigation expert Thomas "Buddy" Wood. In July 2010, the Commission requested further comment from the SFMO, CFD and IP (*See* Exhibits 9, 10 & 11). Each entity provided a response (*See* Exhibits 12, 13 & 14). The FSC also received several unsolicited comments. Since receiving the complaint, the Commission has gathered and reviewed thousands of pages of documents and received extensive input from fire scientists and investigators. Commissioners have also heard public comment at numerous meetings.

On January 7, 2011, the FSC convened an expert panel during which Ed Salazar, Assistant State Fire Marshal of the SFMO, Dr. John DeHaan, Dr. Craig Beyler and Houston fire investigator Buddy Wood provided extensive comments and responded to questions from Commissioners. The FSC also heard brief comments from Paul Maldonado, the Texas State Fire Marshal, and Ed Cheever, fire investigator for the SFMO.

On January 21, 2011, the FSC directed the general counsel to begin drafting a final report. Since that time, FSC staff has drafted this document, which serves as a starting point for discussion.[3]

V. PROCEDURAL HISTORY OF CONVICTIONS AND APPEALS

A. Cameron Todd Willingham

After a jury trial in the District Court of Navarro County, Texas in August 1992, Cameron Todd Willingham was convicted and sentenced to death for killing his three children by setting fire to their home in Corsicana, Texas. For a summary of the criminal case, *see Willingham v. State*, 897 S.W.2d 351 (Tex. Crim. App. 1995) (*See* Exhibit 15).

The CFD was the first to respond to the fire on December 23, 1991; CFD investigators Doug Fogg and James Palos began reviewing the scene immediately after fire suppression activities concluded. The CFD also contacted the SFMO for assistance, and SFMO Deputy Fire Marshal Manuel Vasquez arrived on December 27, 1991. Mr. Fogg is now retired from the CFD and Mr. Vasquez is deceased. Mr. Palos is currently the Fire Marshal of the CFD.

Direct appeal. Following a mandatory direct appeal, the Texas Court of Criminal Appeals affirmed Willingham's conviction and sentence. *Id.* at 359. A motion for rehearing was denied on April 26, 1995. The United States Supreme Court denied a petition for writ of certiorari. *Willingham v. Texas*, 516 U.S. 946 (1995). (*See* Exhibit 16).

[3] No Commissioner has discussed this document with any other Commissioner and no consensus or conclusion has been reached regarding its ultimate contents. No aspect of this document should be considered final; the document merely serves as a discussion starting point and will be reviewed and revised by the Commission during its April public meeting.

State post-conviction litigation. Willingham filed a petition for writ of habeas corpus in state court. The Texas Court of Criminal Appeals denied the petition for relief. *Ex parte Willingham*, No. 35,162 (Tex. Crim. App. 1997). The United States Supreme Court denied a petition for writ of certiorari. *Willingham v. Texas*, 524 U.S. 917 (1998). (*See* Exhibit 17).

Six years later, Willingham filed a petition for writ of habeas corpus in state court, attaching a statement challenging the fire investigation. (*See* Exhibit 18). The Texas Court of Criminal Appeals denied the petition, finding that it did not meet the legal requirements for a claim of newly discovered evidence of actual innocence. *Ex parte Willingham*, No. 35,162-02 (Tex. Crim. App. 2004).

Federal post-conviction litigation. Willingham filed a petition for writ of habeas corpus in federal court. A federal magistrate judge denied the petition, and the federal district court judge agreed with the magistrate's denial. *Willingham v. Johnson*, No. 3:98-CV-0409-L, 2001 WL 1677023, at *1 (N.D. Tex. Dec. 31, 2001). (*See* Exhibit 19). A federal court of appeals agreed with the district court. *Willingham v. Cockrell*, No. 02-10133, 2003 WL 1107011 (5th Cir. Feb. 17, 2003). (*See* Exhibit 20). The United States Supreme Court also denied a petition for writ of certiorari. *Willingham v. Dretke*, 540 U.S. 986 (2003). (*See* Exhibit 21).

Pardon application. On January 26, 2004, Willingham filed an application for commutation with the Board of Pardons and Paroles (petition for commutation and stay of execution). The Board voted 15-0 to deny the request.

B. Ernest Ray Willis

After a jury trial in the District Court of Pecos County, Texas in August 1987, Ernest Ray Willis was convicted and sentenced to death for killing two women in the course of committing arson in Iraan, Texas. For a summary of the criminal case, *see Willis v. Cockrell*, No. P-01-CA-20, 2004 WL 1812698 (W.D. Tex. Aug. 09, 2004). (*See* Exhibit 22). Pecos County fire investigator John Dailey and SFMO fire investigator Edward Cheever both testified at Willis' trial.

Direct appeal. Following a mandatory direct appeal, the Texas Court of Criminal Appeals affirmed the conviction and sentence of Willis. *Willis v. State* 785 S.W.2d 378, 387 (Tex. Crim. App. 1989). (*See* Exhibit 23). The United States Supreme Court denied a petition for writ of certiorari on October 9, 1991. *Willis v. Texas*, 498 U.S. 908 (1990). (*See* Exhibit 24).

State post-conviction litigation. On June 7, 2000, the trial court that originally convicted Willis recommended that he be granted a new trial based on ineffective assistance of counsel, withheld psychiatric profile and administration of involuntary drugs by the State. (*See* Exhibit 25). However, the Texas Court of Criminal Appeals disagreed and denied Willis relief on December 13, 2000. (*See* Exhibit 26).

Federal post-conviction litigation. Willis then filed a petition alleging 1) violation of the Eighth and Fourteenth Amendments; 2) the State's wrongful administration of antipsychotic medications; 3) defense counsel's ineffective assistance at trial and sentencing phases; 4) the prosecution suppressed evidence material to his sentencing determination; and 5) the cumulative effect of error in

all four claims violated due process. *See Willis v. Cockrell,* No. P-01-CA-20, 2004 WL 1812698 (W.D. Tex. Aug 09, 2004). (*See* Exhibit 27). The United States District Court for the Western District of Texas granted relief on August 9, 2004. *Id.* at *34-35.

Release. Willis was released from prison on October 6, 2004. The Texas Attorney General's office declined to appeal, and prosecutors dropped all charges against him.

VI. HISTORY OF FIRE SCIENCE AND INVESTIGATION

A. Standard of Practice in 1991

After soliciting and reviewing input from numerous sources, the FSC concludes that there was no uniform standard of practice for state or local fire investigators in the early 1990's in Texas or elsewhere in the United States. (DeHaan at 1.) In fact, before the release of NFPA 921 in 1992, there was no single document describing the standard of practice in fire investigation. (Beyler at 2.) Investigators relied upon the process of elimination; a cause would be eliminated if it "was inconsistent with known case facts or was not physically possible." (Beyler at 4.)

The FSC also notes that in the early 1990's, fire investigators (including but not limited to those in this case) relied heavily upon the teachings of their mentors regarding the nuances involved in interpreting incendiary indicators. Access to controlled burn experiments and other practical guidance regarding the science of fire behavior was limited. At the national level, the NAS Report notes the prevalence of apprenticeship training across forensic disciplines, finding that

reliance on "apprentice-type training" and a "guild-like structure" works against predictability. (NAS Report at 15-16.) Similarly, the knowledge levels on which fire investigation practices were based at the time were "extremely variable" due to the "one-on-one training that dominated." (DeHaan at 1.) The FSC has also observed that while scientific papers and textbooks describing some of the "modern" fire science principles existed in the early 1990's, it is difficult to determine how widely those materials were disseminated, or whether they were understood and accepted by fire investigators at the time. (*Id.* at 5.)

B. Contemporary Standard of Practice

The contemporary standard of practice is expressed in NFPA 921 *Guide for Fire and Explosion Investigations*, published by the National Fire Protection Association ("NFPA"). (Beyler at 1.) Work on NFPA 921 began in the mid-1980s but it was not published until 1992. *Id.* As recognized by various experts, there was a "natural period of time" before NFPA 921 gained universal recognition among investigators. (Beyler at 1.) Most experts believe that it took at least until the mid-1990's for NFPA 921 to be widely accepted. (Beyler at 1, DeHaan at 2.) As Edward Cheever noted at the January 7th hearing, until the late 1990's the SFMO maintained only one copy of NFPA 921 at each regional office. Today, every SFMO investigator is issued a copy of NFPA 921.

Standards in fire investigation are not static and will continue to develop over time. For example, the NFPA recently released the 2011 edition of NFPA 921, which contains revised and enhanced standards. In addition, in 2009 the NFPA released NFPA 1033, which suggested minimum educational requirements

for fire investigators. Many of the educational guidelines discussed in NFPA 1033 focus on specific subject areas in science. FSC recommendations regarding adoption of NFPA 1033 are set forth in Section XI below.

C. Perceived Gap in Understanding Between Fire Scientists and Fire Investigators

Many Commissioners are concerned about perceived differences in understanding of fire indicators between the scientists and engineers who study principles underlying fire indicators, and the state and local professionals who respond to and investigate fires. One challenge is the lack of science education on the part of many fire investigators. (DeHaan at 6.) Though this dynamic is changing as younger classes of investigators gain exposure to college coursework in chemistry and physics, most active investigators do not have scientific backgrounds. *Id.* Those charged with teaching and training fire investigators also bear some responsibility for ensuring that principles are communicated effectively to investigators. Moreover, the FSC's experience during the course of this Investigation shows the importance of creating an environment in which scientists and investigators have frequent opportunities to meet and exchange their knowledge and experience, where open and honest dialogue can occur, and where discussion of fire scene variables and hypotheticals is encouraged.

Highlighting the perceived gap between the fire science and fire investigation communities is the following language in the SFMO's submission to the FSC on August 20, 2010, which was of concern to many Commissioners:

> "In reviewing documents and standards in place then and now, we stand by the original investigator's report and conclusions." (SFMO Aug. Ltr. at 1.)

Most Commissioners felt that this language was too absolute. The fires in these cases occurred two decades ago; there are few circumstances in which an investigation could not be improved with the benefit of twenty years of controlled scientific experiment and practical experience.

The Commission notes the importance of the tone and culture established by the leadership of any organization. Leadership must engage in ongoing internal review to ensure that information regarding scientific advancement is disseminated properly, and mistakes (if they occur) are identified and corrected in a timely manner. Specific recommendations regarding these issues are set forth in Section XI below.

Concerns raised by the SFMO's August letter have been tempered by the agency's willingness to work with the Commission in developing methods for improving training for fire investigators in Texas. The FSC also recognizes that it could have engaged in more frequent communication with the SFMO during the course of the Investigation, which may have encouraged a more open and continuous dialogue. Lessons learned by the FSC during the course of this Investigation will be applied to future investigations.

VII. USE OF THE SCIENTIFIC METHOD

The 1995 edition of NFPA 921 described fire investigation as a "complex endeavor involving both art and science." (NFPA 921, 1995 edition at 2-1.). The basic methodology of fire investigation relies on the use of a systematic approach (*i.e.,* the scientific method as described in NFPA 921) and attention to all relevant detail. (*Id.* at 2-2). While earlier editions of NFPA 921 described six steps in

applying the scientific method to fire investigation, the 2008 edition of NFPA 921 describes eight:

- **4.3.1 Recognize the Need.** First, one must determine that a problem exists. In this case, a fire or explosion has occurred and the cause must be determined and listed so that future, similar incidents can be prevented.

- **4.3.2 Define the Problem.** Having determined that a problem exists, the investigator or analyst must define in what manner the problem can be solved. In this case, a proper origin and cause investigation must be conducted. This is done by an examination of the scene and by a combination of other data collection methods, such as the review of previously conducted investigations of the incident, the interviewing of witnesses or other knowledgeable persons, and the results of scientific testing.

- **4.3.3 Collect Data.** Facts about the fire incident are now collected. This is done by observation, experiment, or other direct data gathering means. This is called empirical data because it is based on observation or experience and is capable of being verified.

- **4.3.4 Analyze the Data.** The scientific method requires that all data collected by analyzed. This is an essential step that must take place before the formation of the final hypothesis. The identification, gathering, and cataloging of data does not equate to data analysis. If the investigator lacks expertise to properly attribute meaning to a piece of data, then assistance should be sought. Understanding the meaning of the data will enable the investigator to form hypotheses based on the evidence, rather than on speculation.

- **4.3.5 Develop a Hypothesis (Inductive Reasoning).** Based on the data analysis, the investigator produces a hypothesis, or hypotheses, to explain phenomena, whether it be the nature of fire patterns, fire spread, identification of the origin, the ignition sequence, the fire cause, or the cause of damage or responsibility for the fire or explosion incident. This process is referred to as inductive reasoning. These hypotheses should be based solely on the empirical data that the investigator has collected through observation and then developed into explanations for the event, which are based upon the investigator's knowledge, training, experience, and expertise.

- **4.3.6 Test the Hypothesis (Deductive Reasoning).** The investigator does not have a provable hypothesis unless it can stand the test of careful and serious challenge. Testing of the hypothesis is done by the principle of deductive reasoning, in which the investigator compares his or her hypothesis to all the known facts as well as the body of scientific knowledge associated with the phenomenon relevant to the specific incident. A hypothesis can be tested either physically by conducting experiments or analytically by applying scientific principles in "thought experiments." When relying on experiments or research of others, the investigator must ensure that the conditions and circumstances are sufficiently similar. When the investigator relies on previously conducted research, references to the research relied upon should be noted. If the hypothesis cannot be supported, it should be discarded and alternate hypotheses should be developed and tested. This may include the collection of new data or the reanalysis of existing data. The testing process needs to be continued until all feasible hypotheses have been tested and one is determined to be uniquely consistent with the facts, and with the principles of science. If no hypothesis can withstand an examination by deductive reasoning, the issue should be considered undetermined.

- **4.3.7 Avoid Presumption.** Until data have been collected, no specific hypothesis can be reasonably formed or tested. All investigations of fire and explosion incidents should be approached by the investigator without presumption as to origin, ignition sequence, cause, fire spread, or responsibility for incident until the use of scientific method has yielded a provable hypothesis.

- **4.3.8 Expectation Bias.** Expectation bias is a well-established phenomenon that occurs in scientific analysis when investigator(s) reach a premature conclusion too early in the study and without having examined or considered all of the relevant data. Instead of collecting and examining all of the data in a logical and unbiased manner to reach a scientifically reliable conclusion, the investigator(s) use the premature determination to dictate their investigative processes, analyses, and, ultimately, their conclusions, in a way that is not scientifically valid. The introduction of expectation bias into the investigation results in the use of only that data that supports this previously formed conclusion and often results in the misinterpretation and/or the discarding of data that does not support the original opinion. Investigators are strongly cautioned to avoid expectation bias through proper use of the scientific method.

One of the primary goals of the scientific method is to detect and minimize investigator bias. (NAS Report at 112.) The FSC emphasizes the importance of applying these principles to fire investigation. The law assumes that every person is innocent until proven guilty, and the use of the scientific method in fire investigation helps to ensure the viability of this principle.

As indicated by Buddy Wood's comments at the January 7th expert panel, today's fire investigators are trained to apply the scientific method as set forth in NFPA 921. However, most investigators do not have access to the resources used by fire scientists to examine a range of controlled hypothetical scenarios. As the NAS report notes, scientists operating in laboratory settings are in a position to continually observe, test and modify the body of knowledge before them. (NAS Report at 112.) Most fire stations do not have controlled burn facilities attached in which investigators can test various hypotheses. Many fire investigators gain their experience by examining scenes that have already been burned. (DeHaan at 3.) In a laboratory, a scientist can vary conditions in order to isolate exclusive effects and understand how various factors influence outcomes. (NAS Report at 112.) The FSC notes that progress achieved by fire scientists in laboratories must be better communicated to those charged with responding to actual fires and conducting real-time investigations.

In sum, the Commission makes the following observations about the scientific method as applied to fire investigation in Texas: (1) fire investigators must apply the scientific method described in NFPA 921 to all investigations; (2) training courses must explain *what that means on a practical level* to ensure that

principles are applied properly, and (3) fire investigators (especially those working in smaller communities) should have more opportunities to participate in and learn from controlled burn exercises and related experiments. *See* Section XI below for specific recommendations regarding these observations.

VIII. OBSERVATIONS REGARDING ANALYSIS OF INCENDIARY INDICATORS AND ALTERNATIVE CAUSES

The FSC recognizes that the value of various incendiary indicators and the manner in which they are identified and evaluated has changed since the Willingham and Willis investigations were conducted. Similar progress has been made in the evaluation of potential accidental causes. The Commission's primary concern is to ensure that today's fire investigators have a comprehensive understanding of how to accurately interpret incendiary indicators and understand their limitations. The FSC appreciates the feedback it has received from local investigators indicating a strong desire to participate in training focused on practical application, including participation in live burn exercises. Specific recommendations regarding training in this area are set forth in Section XI below.

A. Elimination of Accidental Causes

A critical component of successful fire investigation is the elimination of accidental causes. The elimination of any single cause requires an investigator to use his or her judgment, and to request outside assistance when necessary. For example, when considering whether a child could have set the fire in the Willingham case, investigators concluded that the possibility was remote considering the ages of the children, the fact that no lighters were found near them

and that a child's gate blocked the bedroom doorway. Many Commissioners view this particular observation as a reasonable exercise of judgment under the circumstances. Investigators would be required to make a similar judgment call today if the same facts were presented.

However, other components of assessing accidental causes have been assisted by developments in science and engineering over the last two decades. For example, scientists and engineers have created methods that allow investigators to conduct a more thorough review of possible electrical malfunction as a point of origin. In the early 1990's, investigators routinely checked for shorts in the line after "pulling" the electrical meter for the safety of those on the scene, in accordance with the safety requirements of NFPA 921. (*See* NFPA 921, 1995 edition at 10-2.4.) If there were no shorts in the line and no evidence of appliance malfunction, investigators concluded that the cause was not attributable to electrical malfunction.

Today's investigators have additional tools at their disposal. For example, investigators can use the process of arc mapping (*See* 2011 edition of NFPA 921) to determine a fire's possible point of origin. Many local investigators are aware of the arc mapping process and often consult electrical engineers for assistance. The FSC understands that the most likely source for engineering expertise in many fire investigations would be the homeowner's insurance company. The SFMO no longer has an electrical engineer on staff due to budgetary constraints.

While the Commission is not in a position to assess whether having an electrical engineer on staff is critical to the SFMO's mission, Commissioners note

that the SFMO should consider cost-effective alternatives for consulting electrical experts as needed. In the case of electrical systems, investigators must know how to conduct a thorough initial evaluation and to identify when an engineer should be requested. Commissioners also note the importance of ensuring sufficient technical support for smaller, more remote communities where investigative resources are limited.

In sum, investigators must be trained to employ methods for eliminating accidental causes that effectively review all facts and circumstances within the framework of the scientific method. Specific recommendations regarding training in this area are discussed in Section XI below.

B. Treatment of Debris

The investigators in both cases have been criticized for not considering fire debris on the scene and simply "shoveling the debris out the window." (Beyler at 29). Because the treatment of debris is an extremely important component of any fire investigation, the Commission conducted further inquiry into how debris was handled in the Willingham case, and whether any changes have been made in treatment of debris over the last two decades. After consulting with the CFD, the Commission learned that the debris was reviewed in detail by investigators. Investigators recall examining the scene "on hands and knees," treating each section systematically with the use of hand tools including small brooms. Debris was identified, analyzed, photographed and documented. Investigators then washed the floor with a low-pressure hose, describing a process in which every inch was examined, swept and gently cleaned. As part of standard

operating procedure, the file was then provided to the District Attorney's office. Despite numerous attempts, the CFD has been unable to retrieve the file.

The Commission's primary concern is that today's fire investigators thoroughly understanding how to properly evaluate, review, photograph, document and remove debris. NFPA 921 addresses the treatment of debris in detail (NFPA 921, 2008 edition at 17.3.2 et seq.) and investigators must be regularly trained and updated on proper treatment and documentation of debris. Even assuming that proper debris analysis and removal was conducted in a case, if the record does not document investigative steps properly, investigators leave themselves open to tremendous scrutiny. Specific recommendations regarding improvements in documentation are set forth in Section XI below.

C. Pattern Indicators

As previously stated, the Commission recognizes that the value of various incendiary indicators and the manner in which they are identified has changed since the early 1990's. Experts have identified indicators that were present in the Willingham and Willis cases that have since undergone extensive scientific testing and experimentation. Such testing has informed scientists' understanding of the limitations of the indicators. The Commission further recognizes that many of these indicators may be present in arson cases where accelerants are used, thus requiring an investigator to use the scientific method as expressed in NFPA 921 to conduct a systematic review. The discussion does not examine every indicator used in the investigators' reports but rather includes illustrative examples applicable to all arson cases. The question of when, why and how certain

limitations should be applied to incendiary indicators is the subject of ongoing study by the fire science community.

1. V-Pattern as Indicator of Origin. In the early 1990's, many fire investigators based their conclusions of origin in part on the theory that a "V-pattern" on a wall points to the origin of the fire. For example, the 1995 edition of NFPA 921 4-17.1 stated: "the angled lines of demarcation, which produce the "V" pattern, can often be traced back, from the higher to lower levels, toward a point of origin. The low point or vertex of the "V" may often indicate the point of origin." NFPA 4-17.1 (1995 edition). Scientists now know that the "V-pattern" simply points to where something was burning at some stage of the fire, not necessarily the origin. (DeHaan at 8.)

2. Pour Patterns. In the early 1990's, many fire investigators reasoned that fire moves upward (at least flames and hot gases do) and that carpet and flooring is difficult to ignite. (DeHaan at 7.) If one pours ignitable liquid on a floor, the carpet burns away in an irregular path similar to the deposits of the liquid. *Id.* Thus, it was often thought that pour patterns at floor level were "nearly proof alone" that the fire was started with an accelerant. *Id.* While such a fire could have been started with an accelerant (*see e.g.,* NFPA 921 1995 edition, 4-17.7.2) other phenomena of fire behavior also cause similar pour-like patterns.

For example, when a fire approaches or surpasses flashover conditions, all of the exposed carpet in the room will ignite. (DeHaan at 7.) Synthetic carpets and pads melt or decompose to liquid as they burn, producing highly irregular and unpredictable patterns. (DeHaan at 8.) The effect of ventilation conditions,

radiant heat, flaming and smoldering debris, and drop-down burning from things like synthetic mattresses and bedding also affect the irregular burn patterns. (Beyler at 8, DeHaan at 7-8.)

Today, fire scientists and investigators have a more comprehensive understanding of the nuances of flashover conditions, including how to analyze their effects. Rigorous, ongoing training is the key to ensuring that all investigators in Texas are knowledgeable about developments in the scientific community's understanding of the complex chemical and physical phenomena involved in fires, including but not limited to the effects of flashover.

3. Low/Deep Burning and Multiple Separate Points of Origin. Low burn patterns may be an indicator of accelerant (Beyler at 8), but scientific experiments have also shown that radiant heat transfer may cause low burn patterns (*Id.*), and that the radiant heat of a fully involved room fire can be sustained to penetrate floors deeply. (DeHaan at 8.) Scientific testing has also shown that ignitable liquids alone do not burn long enough to penetrate floors deeply. (*Id.*) Similarly, the appearance of multiple separate points of origin may provide evidence that a fire was intentionally set, but may also be attributable to radiation and drop down effects. (Beyler at 14.)

Today, fire scientists and investigators have a more comprehensive understanding of the nuances of low burn and deep burn patterns, as well as the various factors that create the appearance of separate multiple points of origin. Continuous, targeted education regarding these indicators will ensure that

investigators understand and effectively analyze the extent to which patterns are attributable to accelerant and/or other factors.

4. Spalling. Spalling (*i.e.,* brown discoloration) occurs when concrete, masonry or brick is exposed to a high rate of heating by flame or high levels of radiation from fuel. (SFMO at 5, citing NFPA 921 1995 edition at 4-6.1.) Controlled laboratory experiments have shown that while spalling may be caused by burning accelerant, it is more often caused by sustained heat from other sources. (Beyler at 11, DeHaan at 5.) It is critical that today's investigators understand how to properly analyze spalling evidence. For example, investigators should be able to identify appropriate samples of adjacent materials and send those materials for laboratory testing to determine the presence of accelerant.

5. Burn Intensity. In the early 1990's, the "widely held belief" among fire investigators was that the flames of a wood-fueled fire are cooler than those fueled by petroleum products. (DeHaan at 8.) Thus, investigators would often conclude that a "hot fire" must have had an accelerant ignition. (*Id.*) Scientists now know that flame temperatures for normal fuels against liquid fuels are similar, and compartment temperatures alone cannot be used to distinguish whether ordinary or liquid fuels were involved. (Beyler at 12, DeHaan at 4.) It is critical that today's fire investigators understand the significance of flame temperature and heat release rates, and how these factors should be viewed within the context of other indicators.

6. Crazed Glass. Crazing is a term used in the fire investigation community to describe a complicated pattern of short cracks in glass. (SFMO at 4

citing NFPA 921 1995 at 4-13-1.) Crazing is the result of the rapid cooling of glass in a hot environment by the application of water spray. (*Id.* citing NFPA 921 1992 at 4-13.1.) While the presence of crazed glass was not as significant an indicator as others (such as pour patterns or low burn patterns), fire scientists and investigators have concluded that it no longer has any value as an indicator. As the SFMO explained at the January 7th panel, today's investigators should not mention the presence of crazed glass in a fire scene report. If crazed glass were mentioned, corrective action would be taken immediately.

The Commission observes that incendiary indicators, including but not limited to those discussed above, are subject to numerous variables that require continuous study and evaluation. Scientific understanding of the indicators has continues to advance as additional experiments are conducted. Training must ensure that fire investigators clearly understand all incendiary indicators and their limitations, including the possible effects of phenomena such as flashover and associated radiation, ventilation, smoldering debris and drop-down effects. The FSC observes that whatever training is provided must include a space in which investigators and scientists are free to exchange information and engage in honest and open dialogue regarding fire behavior and incendiary indicators. Specific recommendations are set forth in Section XI below.

D. Use of the "Ignition Matrix" in Evaluating Sources

New tools exist to help investigators identify and analyze various sources of ignition during a fire investigation. For example, the Ignition Matrix (attached hereto as Exhibit 28) was introduced in the latest edition of *Kirk's Fire*

Investigation and NFPA 921 as a straightforward method for ensuring compliance with the various requirements of NFPA 921.[4] The matrix prompts investigators to ask a series of questions regarding potential ignition sources. Investigators then label the information they have gathered based on pre-established color and notation categories. The approach constitutes a best practice method for evaluating sources of data at the scene of a fire and documenting the facts relied upon when reaching conclusions about various ignition possibilities. When carried out with a comprehensive map of the suspected area of origin, the Ignition Matrix provides investigators with a concrete way to conduct a methodical review of data and facts before forming an opinion, in compliance with NFPA 921. Specific recommendations regarding training and use of the Ignition Matrix are provided in Section XI below.

E. Confirmation of Accelerant Through Laboratory Testing

At the time these cases occurred, positive laboratory results were accepted if they were available, but they were not considered necessary to reach the conclusion that the fire involved intentional use of an accelerant. (Beyler at 13.) As technology advanced, fire scientists and investigators developed a better understanding of the importance of confirmatory testing. Experts have also noted that technology used in gas chromatography/mass spectrometry testing is more sensitive today than it was in the early 1990's. As a result, laboratory tests are better able to detect evidence of accelerant than they were two decades ago. Due

[4] Information regarding the Ignition Matrix, developed by Lou Bilancia, was provided to the FSC by Dr. John DeHaan in February 2011.

to the passage of time, re-testing of samples taken in the Willis and Willingham cases is not an option.

The FSC notes that laboratory testing is relied upon more heavily today due to improvements in technology and enhanced expectations of lawyers and judges. Fire investigators should have a thorough understanding of the importance of laboratory testing as a tool for confirming the theory of a case, especially where arson is suspected.

F. Eyewitness Accounts

Eyewitness interviews, while not typically scientific in nature, are a critical component of NFPA 921's investigative guidelines. For example, the 1995 edition of NFPA 921 provided guidance to investigators regarding the purpose of interviews (to gather both useful and accurate information). (NFPA 921 at 7-4.1.) The document also distinguished between three categories of interviews: (1) "Interviews with Those You Can Approach with an Attitude of Trust;" (2) "Interviews with Those You Must Approach with Caution;" and (3) "Interviews with Those You Must Approach with an Attitude of Distrust." (*Id.* at 7-4.4, 7-4.5, 7-4.6.)

Investigators in the Willingham case alone interviewed more than sixty witnesses.[5] Without commenting on the weight of any particular eyewitness account, the Commission notes that fire investigators will continuously be expected to interview eyewitnesses and assess their credibility. While eyewitness

[5] *See* letter from CFD attached hereto as Exhibit 5. Because the investigators have not been interviewed by the FSC, it would be extremely difficult to re-create the methodology and analytical process employed during each interview.

testimony plays a valuable role in the criminal justice system, it is a product of human memory, which has inherent limitations. Many Commissioners believe it is important to note these limitations and the associated need for ongoing training in methods for properly conducting and evaluating eyewitness interviews during arson investigations. Arson investigators should receive training in current techniques that encourage objectivity in witness interviews. They should also record the interviews so that they are subject to future review. Specific recommendations are provided in Section XI below.

IX. EVOLUTION OF STANDARDS GOVERNING ADMISSIBILITY OF EXPERT TESTIMONY AND FORENSIC EVIDENCE

Before Federal Rule of Evidence ("FRE") 702 was adopted in 1975, many courts in the United States followed a "general acceptance" standard for admitting scientific expert testimony. *Frye v. United States,* 54 App. D.C. (1923). Under this standard, testimony was admitted if its scientific basis was "generally accepted" by the scientific community. With the adoption of FRE 702, expert testimony was permitted if the information would "assist the trier of fact." After FRE 702 was adopted, many courts struggled with the question of whether the rule included or rejected the concept of "general acceptance" set forth in *Frye*.

When the Willingham and Willis cases were tried, Texas courts allowed expert testimony and scientific evidence to be admitted if the information would "assist the trier of fact" under Texas Rule of Evidence 702, which was based on FRE 702 and had been adopted in 1986. *Kelly v. State*, 824 S.W.2d 568, 572 (Tex. Crim. App. 1992). Most expert testimony, including that of fire experts and investigators, was readily admitted into evidence, and the jury was then allowed

to assign varying degrees of weight to the testimony depending upon perceptions of credibility. The judge did not make a preliminary determination of reliability or relevance outside the presence of the jury.

In 1992, the Texas Court of Criminal Appeals explicitly rejected *Frye* and required courts to determine whether evidence is reliable and "relevant to help the jury in reaching accurate results." *Id.* Though *Kelly* provided stricter criteria for admitting expert testimony and forensic evidence, it still did not provide a mechanism for screening evidence and testimony outside the presence of the jury.

A year after *Kelly* was issued by the Texas Court of Criminal Appeals, the United States Supreme Court also rejected the *Frye* standard in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993). Similar to the enhanced requirements set forth in *Kelly*, *Daubert* required a stricter standard than the "general acceptance" standard set forth in *Frye*. The Court explained that judges must make an initial determination regarding the evidence or testimony's reliability. It was then that judges began to assume the role of "gatekeepers" for expert testimony, much of which is scientific or otherwise highly technical in nature. The Texas Supreme Court also adopted the *Daubert* standard explicitly in 1995, requiring that scientific evidence and related testimony must not only be relevant but must also have a reliable, underlying scientific validity. *E.I. du Pont de Nemours & Co. v. Robinson*, 923 SW2d 459 (Tex. 1995).

The standards set forth in *Daubert, Kelly* and similar cases require expert witnesses to understand and describe the science behind their conclusions before

they are allowed to testify to a jury regarding those conclusions. Though many fire investigators could describe complex fire science principles before *Daubert*, not everyone agreed on the scientific nature of fire investigation. (DeHaan at 6.) For example, the International Association of Arson Investigators ("IAAI") filed an *amicus curiae* brief in *Kumho Tire Company, Ltd. v. Carmichael*, et al., 526 U.S. 137 (1999) arguing that fire investigation was not strictly based on science and therefore investigators should be exempt from the judicial expectation. *Id.* The IAAI's arguments were eventually rejected and fire investigators are now expected to be able to demonstrate their methods, rationale, and scientific expertise. *Id.*

The Commission observes the importance of conducting admissibility hearings in arson cases. In light of the continuously evolving nature of fire science, it is imperative that judges provide a meaningful opportunity for each side to establish the relevance and reliability of fire science methodology before testimony is admitted. FSC recommendations regarding enhanced admissibility hearings (*i.e., Daubert*/*Kelly* hearings) for arson cases are set forth in Section XI below.

X. OBSERVATIONS REGARDING TRIAL TESTIMONY

As discussed above, when the Willingham and Willis cases were tried, *Daubert* had not yet been issued, and judges had yet to assume a gatekeeping role for the admission of scientific testimony outside the presence of the jury. As the CFD noted in its submission to the FSC, *Daubert* and subsequent Texas cases (*see e.g., E.I. du Pont de Nemours v. Robinson*, 923 S.W.2d 549 (Tex. 1995)) provided

a mechanism for lawyers to challenge expert testimony in cases where they perceived the evidence to be unreliable. (CFD at 3.)

Some Commissioners have raised concerns about the tone and scope of expert testimony in arson cases; examples from the Willingham case may be used as an educational tool for today's fire investigators. As a threshold matter, a review of trial testimony offers an incomplete snapshot of an underlying fire investigation. Most testifying experts know from experience that the pace and tone of testimony is often dictated by counsel and is subject to the judge's ability to control the courtroom effectively. As noted in the NAS Report, the adversarial process relating to the admission and exclusion of scientific evidence is not well-suited to the task of finding "scientific truth," due in large part to the fact that lawyers and judges have very limited exposure to scientific principles (NAS Report at 12.) Testifying experts must continuously strive to ensure that their testimony is communicated clearly and accurately, even under the pressures of heated cross-examination.

The NAS Report also observes that there is a need to develop consensus within forensic fields about the precise meaning of terms used to describe a particular forensic analysis. The use of vocabulary can have a profound effect on how the trier of fact perceives and evaluates evidence. (NAS Report at 185.) Even today, few disciplines have developed common vocabulary for use in reporting results in the courtroom. Where such developments have occurred, they are not standard practice. (*Id.* at 186.) Courtroom testimony must be presented in a way that allows the jury to understand and properly weigh and interpret

testimony. *Id.* In the early 1990's, fire investigators did not receive instruction on what vocabulary to use in describing the phenomena of fire behavior. The standardization of reporting (*see* recommendations in Section XI below) should provide fire investigators with a foundation from which to develop consistent methods for discussing indicators in court.

The Commission is still in the process of determining whether and to what extent trial testimony should be considered as part of the "forensic analysis" reviewed during FSC investigations. Accordingly, the discussion below uses illustrative examples to suggest appropriate boundaries for expert testimony. It also includes a review of concrete steps taken by the SFMO to educate and support fire investigators who testify in courts today, as well as commentary on the roles of judges and lawyers.

1. Suggestions Regarding General Boundaries in Expert Testimony

As an initial observation, the FSC notes that testimony must be viewed in context. For example, Deputy Fire Marshall Vasquez made statements at the Willingham trial such as "The fire tells a story. I am just the interpreter," and "The fire does not lie. It tells me the truth." During the FSC's January 7th hearing, Buddy Wood indicated that this language was commonly used at the time by instructors at training seminars, and was even used in written materials distributed during training sessions. Conversations with other investigators who were active during that period confirm that the language is consistent with their recollection of common terms used by experts to describe fire behavior. In fact, investigators have observed that this language reflects "verbatim" what they were

taught in training courses. This example highlights the importance of establishing consensus within the field on a common vocabulary for explaining fire dynamics so that testifying experts have clear guidelines to rely upon on when explaining concepts to a lay jury.

Other testimony, such as Vasquez's response to a question regarding Willingham's state of mind, is an example of the type of testimony that experts should avoid. As the CFD noted in its submission to the FSC Vasquez "could not read Todd Willingham's mind." (CFD at 4.) Defense counsel did not object to the question, and the judge did not interject with an instruction to the jury. This testimony might have been permitted before *Kelly*, *Daubert* and *Robinson*, but would likely be limited under the stricter standards established by those cases. The Commission observes that today's testifying experts must understand when and how to resist counsel's attempts to push testimony beyond measurable facts and scientific principles.

Another example is the statement that in the 1200-1500 fires Vasquez investigated, almost all of them were arson. Discussion at the January 7th panel indicated that the SFMO is usually called to the scene in cases where arson is already suspected by local investigators, which would result in a higher number of arson cases than one might ordinarily expect. Scientists on the Commission have noted that this dynamic raises concerns about cognitive bias similar to those observed in other areas of forensic science. As discussed in the NAS Report, human judgment is subject to many different types of biases. (NAS Report at 122.) For example, in the Madrid bombing case, an FBI fingerprint analyst

identified a man named Brandon Mayfield as a positive match based on a latent print found at the scene. The FBI later determined that once the fingerprint examiner had declared the first match, both he and the other examiners who were aware of the finding were influenced by the urgency of the investigation to confirm the first match during the second review. (NAS Report at 123.) As the NAS Report observes, cognitive biases are not the result of character flaws; instead, they are common features of decision-making. *Id.* at 122.

The FSC recognizes that ideally, all biases would be removed and complete independence would be ensured in all investigative settings. However, in an environment where there are limited resources to conduct fire investigations, the SFMO will continue to be called upon to assist with complex investigations in which cause and origin are difficult to determine and arson is suspected. While fire investigators do not have any direct incentive to reach a finding of arson, they will continue to be subject to intense pressure by counsel to make certain statements at trial. The following section discusses one approach the SFMO has taken to minimize any perception of bias for cases in which it is called to the scene by local investigators and subsequently required to testify in court regarding the investigation.

2. Current Approach to Courtroom Testimony by Fire Investigators

The SFMO has taken steps to ensure that its investigators understand and recognize possible bias and observe appropriate boundaries when testifying in court. For example, in the last few years, the SFMO began conducting mock trials with its investigators. Attorneys who participate in the mock trials attempt

to force investigators to "cross the line" into testimony that may not be supported by the facts or scientific analysis, but is difficult to resist in a highly pressurized environment. The SFMO conducts these mock trials in a peer review setting, thereby encouraging active dialogue among investigators regarding the specifics of each examination. While these mock trial programs have been effective, their reach is limited. The Commission makes recommendations regarding expansion of this program in Section XI below.

3. The Role of Lawyers and Judges

The responsibility for ensuring that scientific testimony is accurately and clearly communicated to the jury does not rest with testifying experts alone. Currently, lawyers and judges in Texas are not required to take any forensic science training as part of their continuing legal education. The legal system relies heavily on forensic science evidence in criminal prosecutions, and the FSC anticipates that such reliance will only increase. As the NAS Report notes, judges, lawyers, and law students would all benefit from a greater understanding of the scientific bases underlying forensic science disciplines and how the underlying scientific validity of techniques affects the interpretation of findings. (NAS Report at 218.) The FSC includes specific recommendations on training of lawyers and judges in Section XI below.

XI. DRAFT RECOMMENDATIONS

RECOMMENDATION 1: ENHANCED CERTIFICATION

The primary mechanism for training and educating fire investigators in Texas is individual certification. The certification process is administered by the Texas Commission on Fire Protection ("TCFP"). Texas has two separate certification titles for fire protection personnel: fire investigator and arson investigator. The main difference between the two is that an arson investigator must be certified both as a fire investigator and as a peace officer. The Texas Commission on Law Enforcement Officer Standards and Education ("TCLEOSE") administers peace officer certification. Below is a summary of requirements for the four existing certification levels: basic, intermediate, advanced and master.

CLASS	FIRE INVESTIGATOR	ARSON INVESTIGATOR
Basic	Completion of a TCFP-approved basic training program; and Successfully passing the TCFP certification exam for fire investigators.	Peace officer license from TCLEOSE or federal equivalent; and Accreditation from International Fire Service Accreditation Congress as fire investigator or TCFP- approved basic fire investigation certificate.
Intermediate	Prerequisite of basic fire investigator certification; and 4 years of fire protection experience and either: • 6 semester hours of fire science or fire technology from an approved Fire Protection Degree Program; or • Acceptable combinations of coursework from either "A-List" or "B-List" courses (*See* Exhibit 29); or • Acceptable combination of college	Prerequisite of basic arson investigator certification; and 4 years of fire protection experience and either: • 6 semester hours of fire science or fire technology from an approved Fire Protection Degree Program; or • Acceptable combinations of coursework from either "A-List" or "B-List" courses; or • Acceptable combination of college

	courses with either "A-List" or "B-List" courses.	courses with either "A-List" or "B-List" courses.
Advanced	Prerequisite of intermediate fire investigator certification; and 8 years of fire protection experience and either: • 6 semester hours of fire science or fire technology from an approved Fire Protection Degree Program; or • Acceptable combinations of coursework from either "A-List" or "B-List" courses; or • Acceptable combination of college courses with either "A-List" or "B-List" courses.	Prerequisite of intermediate arson investigator certification; and 8 years of fire protection experience and either: • 6 semester hours of fire science or fire technology from an approved Fire Protection Degree Program; or • Acceptable combinations of coursework from either "A-List" or "B-List" courses; or • Acceptable combination of college courses with either "A-List" or "B-List" courses.
Master	Prerequisite of advanced fire investigator certification; and 12 years fire protection experience; and 60 college semester hours or an associate's degree that includes at least 18 hours in fire science subjects.	Prerequisite of advanced arson investigator certification; and 12 years fire protection experience; and 60 college semester hours or an associate's degree that includes at least 18 hours in fire science subjects.

A. Continuing Education Requirements

Texas fire and arson investigators are required to maintain their certification by participating in at least 20 hours of continuing education coursework from the "A-List" or "B-List", or a combination of the two. Alternatively, if an individual has completed a TCFP-approved academy in the 12 months prior to his or her certification expiration date, a copy of that certificate of completion is documentation of continuing education for that certification

renewal period.[6] Arson investigators are also required to maintain their peace officer certification, which requires an additional 40 hours of continuing education coursework per training cycle (training cycles are two years long; the next cycle runs from September 1, 2011 to August 31, 2013.)[7]

B. NFPA 1033 Guidelines

In 2009, the NFPA released enhanced guidelines for education and training of fire investigators nationwide, and clarified that the guidelines should apply to *all fire investigators*. Under NFPA 1033's guidelines, fire investigators should have, at a minimum, a high school degree plus successful coursework in the following topics at a "post-secondary education" level:

- fire science;
- fire chemistry;
- thermodynamics;
- thermometry;
- fire dynamics;
- explosion dynamics;
- computer fire modeling;
- fire investigation;
- fire analysis;
- fire investigation methodology;
- fire investigation technology;
- hazardous materials; and
- failure analysis and analytical tools. (NFPA 1033 at 1.3.8.)

Fire investigators must also maintain their knowledge in these subject areas and "remain current" with investigation methodology, fire protection technology, and code requirements by attending workshops and seminars and/or through professional publications and journals. (*Id.* at 1.3.7.)

[6] Information on fire investigator training and continuing education requirements was obtained from the most recent edition of the Texas Commission on Fire Protection's *Standards Manual for Fire Protection Personnel*.

[7] http://www.tcleose.state.tx.us/content/licensing_certifications.cfm

The Commission could recommend that the TCFP create a timeline for requiring all investigators to comply with NFPA 1033. The first phase could require that any fire investigator who testifies in court come into compliance with NFPA 1033 standards as soon as practicable. Subsequent phases could require compliance based on the levels of responsibility assumed by investigators. The timeline should be aggressive but flexible to encourage a smooth transition toward compliance. (The TCFP may wish to consider a grandfathering mechanism if necessary.) Continuing education requirements promulgated by the TCFP should incorporate NFPA 1033's guidelines.

RECOMMENDATION 2: LESSONS FROM ACCREDITATION

As a threshold matter, the FSC notes that laboratory testing on fire debris admitted into evidence in Texas courts is already subject to accreditation. For example, the SFMO laboratory that reviews fire debris is accredited through the American Society of Crime Laboratory Directors—Laboratory Accreditation Board ("ASCLD—LAB"). At this time, neither the Department of Public Safety ("DPS") nor the SFMO have plans to accredit the broader field of fire investigation. Some Commissioners have suggested that the two agencies should work together to analyze the benefits and drawbacks of accreditation. One obvious benefit is that it provides an agency with an ongoing mechanism for assessing internal performance and implementing best practices. While the FSC might not be prepared to recommend that DPS include fire investigation on its list of accredited forensic science disciplines at this time, the SFMO and local fire

departments can benefit from certain aspects of accreditation now by incorporating some of the quality control elements described below.

RECOMMENDATION 3: COLLABORATIVE TRAINING ON INCENDIARY INDICATORS

The FSC is encouraged by recent efforts among fire scientists,[8] investigators and officials at the SFMO to develop a training course that includes hands-on analysis of incendiary indicators through live burn exercises. The SFMO and TCFP should work with local fire departments to encourage maximum participation, possibly by offering sessions in multiple regional locations. A special effort should be made to ensure participation by smaller rural communities. The FSC recommends, at a minimum, the following subjects be reviewed:

- fire science basics;
- fuels;
- ignition;
- fire growth;
- incendiary indicators;
- myths and misconceptions;
- elimination of accidental causes;
- proper documentation and photos;
- eyewitness interviews;
- diagrams and use of the Ignition Matrix.

Training should be limited to active fire investigators currently serving in Texas to encourage an open and honest exchange (similar to the "post-mortem" sessions conducted by medical doctors and scientists). It should include opportunities for investigators to participate in live burn exercises. All attendees should be given current copies of NFPA 921 and *Kirk's Fire Investigation* at a minimum.

[8] The FSC is especially grateful to Dr. John DeHaan for working with Commission staff to develop a suggested training curriculum.

Participants should receive continuing education credit for their attendance. Finally, an examination should be given at the end of the course to determine whether attendees absorbed key principles.

RECOMMENDATION 4: PERIODIC CURRICULUM REVIEW

The FSC could recommend that stakeholders (including representatives from the TCFP, SFMO, fire investigators and scientists) form a regular working group to review training curricula and ensure that it meets the ongoing needs of fire investigators in Texas. The group could also identify ways to take advantage of Internet-based training such as CFITrainer and virtual reality fire investigation programs. Because CFITrainer provides a variety of online options for achieving compliance with NFPA 1033, use of the website may be particularly helpful in rolling out the enhanced certification requirements discussed above.

RECOMMENDATION 5: INVOLVEMENT OF SFMO IN LOCAL INVESTIGATIONS

Local fire departments call the SFMO for assistance when they believe a case is significant enough to warrant such assistance. If the SFMO has personnel available, it sends them to assist. Based on discussions with SFMO leadership, it appears that the SFMO is always available to assist when called upon; the agency rarely (if ever) denies assistance. Some Commissioners have questioned whether there should be clear legal requirements governing cases in which the SFMO appears for assistance. For example, should the Commission recommend to the Texas Legislature that an Advanced or Master Arson Investigator from the SFMO be required to participate in certain investigations by law, such as those involving

the loss of life, regardless of whether a local fire department calls for assistance? What would the implications of such a requirement be?

RECOMMENDATION 6: ESTABLISHMENT OF PEER REVIEW GROUP/MULTIDISCIPLINARY TEAM

Consider establishing a peer review group (perhaps to include someone from the SFMO, a local investigator, a fire scientist and a medical examiner) to review pending and completed arson cases on a quarterly basis (similar to the cold case DNA task force group, or CPS' review of child abuse cases, multidisciplinary team (MDT) models, etc.) This would be a good-faith effort to assure the public that there is a review mechanism in place, especially for arson cases involving fatalities. It would also be a way to encourage ongoing professional development across the field. The most efficient approach may be to establish regional MDTs.

RECOMMENDATION 7: STANDARDS FOR TESTIMONY IN ARSON CASES

The FSC could recommend that the Texas Legislature require fire investigators who testify in criminal cases to meet certain educational requirements. For example, the Commission could recommend that only those investigators who meet the guidelines set forth in NFPA 1033 be permitted to testify in criminal cases. Alternatively, the Commission could suggest a tiered approach in which only those who meet NFPA 1033 guidelines are allowed to testify in criminal cases where certain provisions of the penal code are implicated (*e.g.,* capital crimes, felonies with potential for imprisonment, etc.). In other cases (*e.g.,* a kitchen fire where property damage is at issue), an investigator could

be allowed to testify as long as the investigator has achieved a certain level of TCFP certification. The Commission could encourage the eventual phasing in of NFPA 1033 as a requirement for all testifying experts.

Cautionary note: If the FSC recommends a required minimum educational level for testifying experts, there is a risk that there would be relatively few experts who meet the qualifications initially. As a result, an expert who meets the educational requirements may be called to testify in a case where that expert could not physically make it to the scene but is otherwise available to provide an analysis based on a review of the fire reports drafted by local investigators. Legal challenges have been raised under the Confrontation Clause based on similar facts in toxicology. For example, in early March, the U.S. Supreme Court heard oral argument in a case involving the admission of forensic analyst testimony related to blood alcohol. (*See Bullcoming v. New Mexico* (No. 09-10876)). The key question was whether the Confrontation Clause permits the prosecution to introduce testimonial statements of a non-testifying forensic analyst through the in-court testimony of a supervisor or other person who did not perform or observe the laboratory analysis directly but who was otherwise qualified to analyze the test. The Supreme Court has yet to issue an opinion on this issue.

RECOMMENDATION 8: ENHANCED ADMISSIBILITY HEARINGS IN ARSON CASES

The FSC could recommend that admissibility hearings (also referred to as *Daubert/Kelly* hearings) be required in all arson cases, due to the inherently complex nature of fire science and the continuously evolving nature of fire investigation standards. Some members of the Commission have observed that

admissibility hearings are not always held, and when held are not always as comprehensive as they should be. The FSC encourages both prosecutors and defense counsel to aggressively pursue admissibility hearings in arson cases. In addition, judges should affirmatively exercise their discretion to hold such hearings in all arson cases as a method of ensuring that fire science testimony is reliable and relevant.

RECOMMENDATION 9: COUNSEL QUESTIONNAIRES FOR EXPERT TESTIMONY

One accreditation practice that could be adopted by the SFMO and local fire departments is to send questionnaires to prosecutors and defense counsel asking for feedback each time a fire investigator testifies at trial. The SFMO could also conduct random audits of trial testimony as a quality assurance measure. Both of these practices are already employed successfully by many crime labs in Texas, as they help lab supervisors ensure consistent and quality testimony.

RECOMMENDATION 10: STANDARDIZATION OF REPORTING

SFMO leadership reviews each fire investigation report submitted by its investigators, and instructs investigators to revise their reports if there is any indication of an incomplete analysis. This process is designed to help ensure that the scientific method is followed by SFMO investigators. However, it is limited to fire reports submitted by investigators employed by the SFMO; there is no standardized reporting method that applies to fire investigators statewide.

The Commission could recommend that the SFMO develop and release a standardized format for fire investigation reporting statewide. As the NAS Report

notes, "there is a critical need in most fields of forensic science to raise the standards for reporting and testifying about the results of investigations." (NAS Report at 185.) The standardized report format should verify that key elements have been reviewed, documented, collected, photographed (to the extent applicable) and analyzed. It should also have a method for red-flagging scenarios in which additional consultation might be necessary (such as when an electrical engineer should be called in to help with arc mapping, etc.). It should track key elements of NFPA 921, and evolve as new editions are released. Tools such as the Ignition Matrix and voice-recognition software could be integrated into the report-writing process. The SFMO has obtained a grant for the use of voice-recognition software; the FSC encourages the agency to seek additional ways to expand opportunities for using the software.

RECOMMENDATION 11: EXPANSION OF SFMO'S MOCK TRIAL PROGRAM

The SFMO should consider expanding its mock trial program to include more participants. One alternative would be to allow for online participation, or to work with the TCFP to make the program a component of continuing education for arson investigators.

RECOMMENDATION 12: WITNESS INTERVIEWS

Training curricula should ensure that arson investigators are exposed to cutting edge interview techniques that help investigators make witness interviews more objective. The interviews should be recorded (if they are not already) to ensure that a record exists for subsequent review. This approach protects interested parties, and provides a source of training for future investigators.

RECOMMENDATION 13: DISSEMINATION OF INFORMATION REGARDING SCIENTIFIC ADVANCEMENTS

The SFMO should identify additional ways to help the fire investigation community in Texas stay current with national developments in fire science. For example, there should be a consistent and effective method for disseminating new information regarding the results of fire science experiments and controlled burn studies. Formats could include quarterly electronic newsletters, regular online forums, periodic webcast updates, NIST and NCJRS library resources, journal abstracting services, etc. The SFMO may also consider retaining a fire scientist to consult on an as-needed basis. Such a relationship would encourage the free flow of information between the two communities and provide a continuous source of outside expertise for particularly challenging interpretive questions.

RECOMMENDATION 14: CODE OF CONDUCT/ETHICS

State agencies and professional organizations often have a Code of Conduct or Ethics to guide expectations. The FSC understands that the SFMO does not currently have such a Code; the FSC could recommend that the SFMO consider establishing a Code of Conduct/Ethics for fire investigators in Texas.

RECOMMENDATION 15: TRAINING FOR LAWYERS/JUDGES

The FSC might recommend that the Texas Legislature consider requiring judges and lawyers practicing in criminal courts to have some form of ongoing forensic science training as a component of their Continuing Legal Education obligations. FSC staff could work with key members of the judiciary and the State Bar of Texas to develop specific proposals.