Procedure for DNA Database Training for PowerPlex® Fusion

1.0 Purpose – To provide a training program for DNA Database analysis using Polymerase Chain Reaction (PCR)-based technology.

2.0 Scope – The training program in this document applies to Forensic Scientists in the DNA Database Section at the State Crime Laboratory.

3.0 Definitions – N/A

4.0 Equipment – Database samples (both blood and buccal) with known profiles.

5.0 Procedure

5.1 Goals

5.1.1 To develop theoretical knowledge of the principles of PCR-based technology.

5.1.2 To develop a thorough understanding of the principles and practices of STR technology as they relate to the forensic analysis of DNA.

5.1.3 To develop the ability to perform independent, accurate analysis of Database samples properly and in accordance with policies and procedures.

5.1.4 (Optional) To develop the ability to perform independent, accurate review of Database files properly and in accordance with section policies and procedures. This portion of training occurs after successful completion of and release from independent DNA Database Analysis training.

5.2 Responsibilities

5.2.1 DNA Database Forensic Scientist Trainee

5.2.1.1 The trainee is required to keep files on all work completed. These files may include, but are not limited to, the following.

5.2.1.1.1 FA Records

5.2.1.1.2 DNA Database PowerPlex® Fusion Training Log

5.2.1.1.3 DNA Database 3500xL Maintenance Training Log

5.2.1.2 Prior to beginning independent analysis, Forensic Scientists shall complete competency tests (known samples), written exam(s), an oral board, and a moot court.

5.2.1.3 (Optional) The trainee is required to maintain documentation for all technical or administrative reviews completed during training. These files may include, but are not limited to, the following.

5.2.1.3.1 DNA Database In-House Run Technical Review Training Log

5.2.1.3.2 DNA Database CODIS Hit Technical Review Training Log

5.2.1.3.3 DNA Database CODIS Hit Combined Technical and Administrative Review Training Log

5.2.2 DNA Database Training Coordinator

5.2.2.1 It is the responsibility of the Database Training Coordinator to provide an outline for the training program, provide the required training samples to the Database Training Officer for assignment and analysis, and work closely with the Database Training Officer, the Technical Leader and Section supervisors to assist and monitor the trainee's progress.

5.2.3 DNA Database Training Officer

5.2.3.1 It is the responsibility of the Database Training Officer to instruct and monitor the trainee, to assign required readings (e.g., scientific literature and technical manuals), and to ensure the trainee has an understanding of required concepts and procedures. It is also the responsibility of the Database Training Officer to maintain continual, open communication between the Database Training Coordinator, the Technical Leader and Section supervisors regarding the trainee's progress.

5.2.3.2 The files listed in the DNA Database Forensic Scientist Trainee section of this procedure require review by the Database Training Officer and/or Forensic Scientist Manager, as well as review/approval by the Technical Leader.

5.2.4 Safety Officer – It is the responsibility of the Safety Officer to provide laboratory safety training to the trainee prior to commencement of training.

5.2.5 DNA Database Forensic Scientist Manager – It is the responsibility of the Forensic Scientist Manager to assign a Database Training Officer to a trainee and to monitor training progress.

5.2.6 Technical Leader – It is the responsibility of the Technical Leader to review training materials and release the trainee to do independent Database analysis. It is also the responsibility of the Technical Leader to release the trainee to perform reviews of Database files. In the event a Forensic Scientist with previous training and/or experience in forensic DNA analysis is hired, the DNA Technical Leader shall assess and document the previous training of the analyst. The Forensic Scientist's training program may be expedited or modified based on the DNA Technical Leader's assessment.

5.3 Aseptic Technique and Contamination Control

5.3.1 Read and understand the DNA Database Section Procedure for Sample Processing Quality Control.

5.4 Documentation of Sample Analysis

5.4.1 Goals

5.4.1.1 To understand and follow quality control protocols for reagents and performance of tests to ensure consistent, reliable results.

5.4.1.2 To provide a thorough record of events for each sample analysis.

5.4.2 Tasks

5.4.2.1 Read and understand the DNA Database Procedure for DNA Reagent Quality Control.

5.4.2.2 Worksheets shall be provided to document each step of the analytical process thoroughly. Each worksheet shall be completed during, or immediately following, the step.

5.5 Sample Accessioning and Processing Training

5.5.1 Goals – To become proficient in performing procedures outlined in the DNA Database Section Procedure for Sample Accessioning and Processing.

5.5.2 Tasks – Complete Sample Accessioning and Processing Training Program.

5.6 DNA Isolation

5.6.1 Goals

5.6.1.1 To develop a thorough understanding of the methodology and theory of DNA isolation from Database samples.

5.6.2 Tasks

5.6.2.1 Attend in-house lecture given by the Database Training Coordinator or designee.

5.6.2.2 Read chapters 1, 18, 2-3 and 7 in the Forensic DNA Typing - Second Edition textbook (Butler).

5.7 Quantitation of DNA (Optional)

5.7.1 Goals

5.7.1.1 To become familiar with the theory of the Real-Time PCR assay.

5.7.2 Tasks

5.7.2.1 Attend in-house lecture for RT-PCR assay given by the Technical Leader or designee.

5.7.2.2 Read chapter 3 in the Forensic DNA Typing - Second Edition textbook (Butler).

5.8 Amplification of DNA

5.8.1 Goals

5.8.1.1 To develop the skills to perform all the tasks required for the amplification of DNA independently and successfully.

5.8.1.2 To develop a thorough understanding of the STR PCR systems used in the Laboratory.

5.8.1.3 To understand the importance and use of controls during the procedure.

5.8.1.4 To understand the various sources of contamination and how to guard against them.

5.8.1.5 To become familiar with the limitations and problems associated with amplification.

5.8.1.6 To understand the purpose for each reagent used in the amplification process as well as each step performed by the thermal cycler.

5.8.1.7 To understand the purpose and become familiar with QC checks of the thermal cyclers.

5.8.1.8 To perform all the tasks required for the amplification of DNA for the STR system or loci under study independently and successfully.

5.8.2 Tasks

5.8.2.1 Read and understand the DNA Database Section Procedure for PCR Amplification with PowerPlex® Fusion.

5.8.2.2 Attend in-house lecture on amplification given by the Database Training Coordinator or designee.

5.8.2.3 Watch demonstration of procedure performed by the Database Training Officer.

5.8.2.4 Read chapters 4-6, 7-11, and Appendix I in the Forensic DNA Typing - Second Edition textbook (Butler)

5.8.2.5 Successfully perform the amplification process.

5.8.2.6 Prepare an environment that minimizes the risk of contamination and follow proper procedures that prevent contamination.

5.8.2.7 Perform quality control tests on the thermal cyclers (optional).

5.8.2.8 Complete documentation for all amplification tests performed above.

5.8.2.9 Successfully complete the DNA Database Amplification quiz.

5.9 Capillary Electrophoresis

5.9.1 Goals

5.9.1.1 To develop the skills to run capillary electrophoresis successfully.

5.9.1.2 To understand the importance and use of controls during the procedures.

5.9.1.3 To develop a thorough understanding of fluorescently-tagged primer systems.

5.9.1.4 To replace buffers (optional).

5.9.1.5 Load polymer for the 3500xL (optional).

5.9.1.6 Install a new capillary array (optional).

5.9.2 Tasks

5.9.2.1 Read and understand the Database Section Procedure for the Use of the 3500xL Genetic Analyzer.

5.9.2.2 Attend in-house lecture given by the Database Training Coordinator or designee.

5.9.2.3 Watch demonstration of procedure performed by the Database Training Officer.

5.9.2.4 Read chapters 12-16 in the Forensic DNA Typing- Second Edition textbook (Butler).

5.9.2.5 Successfully prepare and run capillary electrophoresis on amplified samples.

5.9.2.6 Successfully replace buffers (optional).

5.9.2.7 Load polymer for 3500xL (optional).

5.9.2.8 Exchange capillary array if needed and perform spatial and spectral analysis (optional).

5.9.2.9 Successfully complete the DNA Database Capillary Electrophoresis quiz.

5.10 Producing and Analyzing Electropherograms

5.10.1 Goals

5.10.1.1 To develop the skill required to produce and analyze electropherograms successfully.

5.10.1.2 To understand the use of and limitations of the current analysis software.

5.10.2 Tasks

5.10.2.1 Attend in-house lecture given by the Database Training Coordinator or designee.

5.10.2.2 Successfully produce and analyze electropherograms using the current software.

5.11 Electropherogram Interpretation and Reporting PCR Results

5.11.1 Goals

5.11.1.1 To develop the skill necessary to report STR type database samples effectively.

5.11.1.2 To become familiar with and develop a thorough understanding of the terminology and presentation of PCR analysis and results.

5.11.1.3 To become skilled in reporting PCR results simply, concisely, and accurately.

5.11.1.4 To become familiar with pertinent scientific literature regarding PCR and STR typing.

5.11.1.5 To develop the skills necessary to interpret electropherograms independently, successfully, and consistently.

5.11.1.6 To develop a thorough understanding of the use of controls in the interpretation.

5.11.1.7 To develop and understand the use and necessity of controls throughout the entire analysis process.

5.11.1.8 To become familiar with and understand the effects of sample concentration on the interpretation and process.

5.11.1.9 To understand the limitations of this process and become familiar with the problems that may be encountered during interpretation.

5.11.1.10 To develop knowledge of the GeneMapper® ID-X Software.

5.11.2 Tasks

5.11.2.1 Read and understand the DNA Database Section Procedure for GeneMapper® ID-X and STR Interpretation with PowerPlex® Fusion and the DNA Database Section Procedure for Samples Analyzed In-House.

5.11.2.2 Watch demonstration of procedure performed by the Database Training Officer.

5.11.2.3 Read chapter 17 in the Forensic DNA Typing - Second Edition textbook (Butler).

5.11.2.4 Interpret all successfully completed electropherograms using the procedures outlined above.

5.11.2.5 Examine any unsuccessful electropherograms and determine the reason for the problem.

5.11.2.6 Successfully complete the DNA Database STR Typing and Analysis quiz.

5.11.2.7 Forensic Scientists who are not previously trained in any STR technology shall examine and successfully report allelic calls on at least 175 known database samples with a 100 % score. Forensic Scientists who are previously trained in an STR technology shall examine and successfully report allelic calls on at least 75 known database samples with a 100% score.

5.12 CODIS

5.12.1 Goals

5.12.1.1 To understand the purposes of CODIS and how it operates at a local, state, and national level.

5.12.1.2 To understand the use of CODIS in databasing, how to enter and remove samples, and how to perform searches.

5.12.1.3 To enter DNA profiles into CODIS and search against the database.

5.12.1.4 To understand how to complete a CODIS hit confirmation.

5.12.2 Tasks

5.12.2.1 Read and understand the Procedure for CODIS-DNA Database and the DNA Database Section Procedure for CODIS Hits.

5.12.2.2 Attend a hands-on demonstration and in-house lecture of the State Crime Laboratory CODIS system given by the CODIS Administrator or Assistant CODIS Administrator.

5.12.2.3 Review and use as a resource the information located on the CODIS website accessible on the CODIS computers.

5.12.2.4 Observe entire process of CODIS hit confirmation demonstration to include the use of the Forensic Advantage (FA) system.

5.12.2.5 Complete a minimum of four (4) mock CODIS hit confirmations.

5.13 Expungements

5.13.1 Goals

5.13.1.1 To become familiar with the DNA Database Section Procedure for Expungement of Arrestee and Convicted Offender Samples.

5.13.1.2 To observe demonstration of expungement process.

5.13.2 Tasks

5.13.2.1 Read the DNA Database Section Procedure for Expungement of Arrestee and Convicted Offender Samples.

5.13.2.2 Complete a minimum of two (2) mock expungements.

5.14 Quality Assurance and Quality Control

5.14.1 Goals

5.14.1.1 To become familiar with pertinent scientific literature regarding PCR and STR typing.

5.14.1.2 To become familiar with audits and inspections performed in the Section and in the Laboratory.

5.14.1.3 To become familiar with quality control documentation.

5.14.2 Tasks

5.14.2.1 Read chapters 19-24 in the Forensic DNA Typing - Second Edition textbook (Butler) and review previous chapters as needed.

5.14.2.2 Develop an understanding of the current DNA Federal Standards (Quality Assurance Standards for DNA Databasing Laboratories and American Society of Crime Laboratory Directors).

5.14.2.3 Read the DNA Database Section Procedure for DNA Reagent Quality Control and the DNA Database Section Procedure for Instrument and Equipment Quality Control.

5.15 Qiagen BioRobot® Universal Training

5.15.1 Goals

5.15.1.1 To understand and be able to operate the Qiagen BioRobot® in the automated processing of Database samples.

5.15.1.2 To understand and be able to perform analysis and technical reviews on data generated from samples processed on the Qiagen BioRobot®.

5.15.1.3 To understand and be able to perform required maintenance procedures.

5.15.2 Tasks

5.15.2.1 Read and understand the DNA Database Section Procedure for Qiagen BioRobot® Universal Using PowerPlex® Fusion and the DNA Database Section Procedure for Instrument and Equipment Quality Control.

5.15.2.2 Observe a minimum of one complete Qiagen BioRobot® run. Perform two complete BioRobot® runs with supervision. Perform at least two training runs independently with the option to perform additional runs as needed.

5.15.2.3 Perform with supervision one daily, weekly, and monthly maintenance procedure.

5.15.2.4 Successfully complete a competency test consisting of both Database sample types using the robotic platform. Successfully complete the DNA Database Qiagen BioRobot quiz.

5.16 Courtroom Testimony

5.16.1 Goals

5.16.1.1 To become skilled in explaining PCR analysis and results simply, concisely and accurately.

5.16.1.2 To become familiar with the proper demeanor, dress and appearance in a courtroom.

5.16.1.3 To address principles and ethical conduct in forensic DNA interpretation and analysis and in giving accurate and clear testimony.

5.16.2 Tasks

5.16.2.1 Attend in-house lecture given by Laboratory Legal Counsel or a designee covering the court system, working with attorneys, juries, courtroom demeanor and ethical practices.

5.16.2.2 Observe one to three testimonies presented by a qualified DNA caseworker (in person or online). It is recommended that the trainee observe this testimony prior to his/her release from training or shortly thereafter.

5.16.2.3 Successfully complete moot court using a mock CODIS hit confirmation.

5.17 Review Training (Optional) – This training will occur after a Forensic Scientist is released to perform independent DNA Database analysis.

5.17.1 In-House Run Technical Reviews

5.17.1.1 Goals

5.17.1.1.1 To develop the skill necessary to technically review in-house run files.

5.17.1.1.2 To understand the proper documentation of in-house run technical reviews.

5.17.1.2 Tasks

5.17.1.2.1 Read and understand the DNA Database Section Procedure for Samples Analyzed In-House.

5.17.1.2.2 Observe a minimum of one in-house run technical review performed by the Database Training Officer.

5.17.1.2.3 Successfully complete a minimum of two technical reviews of in-house run files that are also technically reviewed by the Database Training Officer with agreed findings.

5.17.1.2.4 Complete the DNA Database In-House Run Technical Review Training Log.

5.17.2 CODIS Hit Technical Reviews

5.17.2.1 Goals

5.17.2.1.1 To develop the skill necessary to technically review CODIS hits.

5.17.2.1.2 To understand the proper documentation of CODIS hit technical reviews.

5.17.2.2 Tasks

5.17.2.2.1 Read and understand the DNA Database Section Procedure for CODIS Hits.

5.17.2.2.2 Observe a minimum of three CODIS hit technical reviews performed by the Database Training Officer.

5.17.2.2.3 Successfully complete a minimum of six technical reviews of CODIS hits that are also technically reviewed by the Database Training Officer with agreed findings.

5.17.2.2.4 Complete the DNA Database CODIS Hit Technical Review Training Log.

5.17.3 CODIS Hit Combined Technical and Administrative Reviews

5.17.3.1 Goals

5.17.3.1.1 To develop the skill necessary to administratively review CODIS hits.

5.17.3.1.2 To understand the proper documentation of CODIS hit combined technical and administrative reviews.

5.17.3.2 Tasks

5.17.3.2.1 Read and understand the DNA Database Section Procedure for CODIS Hits.

5.17.3.2.2 Observe a minimum of three CODIS hit combined technical and administrative reviews performed by the Database Training Officer.

5.17.3.2.3 Successfully complete a minimum of six combined technical and administrative reviews of CODIS hits that are also administratively reviewed by the Database Training Officer with agreed findings.

5.17.3.2.4 Complete the DNA Database CODIS Hit Combined Technical and Administrative Review Training Log.

6.0 Safety – This document provides an overview to procedures that are written in additional detail in specific DNA Database documents. To see safety hazards for particular procedures, reference the appropriate document listed in the references section.

7.0 References

DNA Database Administrative Policy and Procedure

DNA Database Administrative Policy and Procedure for Safety and Hazardous Waste Disposal

DNA Database Section Procedure for CODIS Hits

DNA Database Section Procedure for DNA Database Training for PowerPlex® Fusion

DNA Database Section Procedure for DNA Reagent Quality Control

DNA Database Section Procedure for Expungement of Arrestee and Convicted Offender Samples

DNA Database Section Procedure for GeneMapper® ID-X and STR Interpretation with PowerPlex® Fusion

DNA Database Section Procedure for Instrument and Equipment Quality Control

DNA Database Section Procedure for PCR Amplification with PowerPlex® Fusion

DNA Database Section Procedure for Qiagen BioRobot® Universal Using PowerPlex® Fusion

DNA Database Section Procedure for Sample Accessioning and Processing

DNA Database Section Procedure for Sample Accessioning and Processing Training

DNA Database Section Procedure for Sample Processing Quality Control

DNA Database Section Procedure for Samples Analyzed In-House

DNA Database Section Procedure for Use of the 3500xL Genetic Analyzer

Forensic DNA Typing. John M. Butler (2nd edition)

Pertinent Readings Assigned by Technical Leader

Procedure for CODIS-DNA Database

Quality Assurance Standards for DNA Databasing Laboratories

State Crime Laboratory Quality Manual

State Crime Laboratory Safety Manual

The Evaluation of Forensic DNA Evidence. National Research Council

8.0 Records

- DNA Database Training Notebooks
- FA Records
- Trainee's Answers to General Questions
- DNA Database Quizzes
- DNA Database Training Competency Test Paperwork
- DNA Database PowerPlex® Fusion Training Log
- Qiagen BioRobot® Training Paperwork/Files
- Qiagen BioRobot® Competency Test Lab Paperwork
- Qiagen BioRobot® Written Competency Test

9.0 Attachments - N/A

Revision History		
Effective Date	Version Number	Reason
08/12/2015	1	Original Document
4/18/2016	2	5.2.5-TL evaluation of previously trained Forensic Scientists ; 5.2.1.2-added written exam, oral board, and moot court
03/03/2017	3	5.2.1.1 subcomponents-Removed documentation not retained; 5.2.2.1 and 5.2.3.1-Added TL to communication; Incorporated DRF; 5.9.1.4 and 5.9.1.5 and 5.9.2.6-Clarified buffer and polymer training requirements; 5.12.1.1-Clarified CODIS levels; 5.12.2.5 and 5.13.2.2-Clarified training requirements; 5.16.2.2-Clarified court testimony observation; Updated References; Updated Records
03/12/2018	4	Added 5.1.4; Added 5.2.1.1.3; Added 5.2.1.3 and subsections; 5.2.6-Added TL requirement to release a trainee to perform reviews; 5.10.1.2-Clarified software type; 5.11.2.1-Added In-House procedure; 5.12.1.2-Added remove samples; 5.12.2.1-Updated CODIS procedure name; Added 5.17 and subsections; 7.0-Updated CODIS procedure name