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Abstract

A two-fold approach was adopted in Orange County, California to improve the efficiency and capacity of the Orange County Crime Lab (OCCL) to screen and process property crime DNA evidence to meet the increasing demand of County law enforcement investigators for property crime DNA analysis. This Property Crime DNA Program featured the utilization of a sophisticated DNA case submission and triage system and the adoption of a team approach to process biological evidence from property crimes using a newly created high volume crime DNA platform.

The Property Crime Triage System that included the utilization of a new case submission process was cooperatively developed and implemented by the OCCL and the Orange County District Attorney's Office (OCDA). Together, members from both entities evaluated DNA analysis requests submitted to the lab from County police agencies. While forensic DNA analysts examined property crime DNA analysis requests from a scientific basis; prosecutors evaluated the same requests from a legal perspective.

The OCCL DNA Section developed and implemented the "OCCL Property Crime High Volume DNA Platform." DNA analysts were assigned to a team that was devoted exclusively to the processing of property crime DNA samples using a customized scheduling system and a highly automated DNA processing platform. Team members worked together to screen, analyze and expeditiously deliver property crime scene DNA sample results each week.

The Property Crime High Volume DNA Platform teams utilized both existing equipment and new instrumentation purchased using 2009 DNA Unit Efficiency Improvement Grant funds.

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New purchases included two types of extraction robots, two different liquid handling robots and a multi-capillary genetic analyzer. The equipment and instrumentation were organized into a Property Crime DNA Analysis Line designed to process hundreds of DNA property crime samples each week and capable of accommodating up to three property crime DNA teams.

With the triage method and Property Crime High Volume DNA Platform in place, it was anticipated that no more than 10 workdays would pass from the time a completed submission packet was received until analysis was commenced (a completed submission packet included police reports, supplemental forms and assurances that necessary elimination standards were collected). Since DNA analysis was expected to take no longer than 15 workdays, it was hoped that law enforcement would have results for property crime cases within 25 workdays from the time the request for DNA analysis was submitted. This goal was not achieved within the time constraints of the project. Instead, the average turn-around-time to provide DNA results to police investigators was 74 workdays.

Orange County believed that the implementation of the new case submission process, the triage method and the OCCL Property Crime High Volume DNA Platform would not only increase the capacity of the lab to process property crime samples but would also allow major case analysts to devote more time to the processing of violent crime cases. The OCCL, therefore, expected to also significantly reduce the average turn-around-time from submission of a request to a completed report for violent/major cases.

The implementation of the new case submission process, the Triage System, and Property Crime High Volume DNA Platform reduced the average turn-around-time for the acceptance and DNA analysis of both property crime cases and violent/major offense cases. (Property crimes are considered “high volume” crimes because they are crimes with the highest recorded

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frequency and recidivism rates. A violent/major crime is any crime where the accused uses or threatens the use of violent force on the victim, such as homicide, rape or assault.) At the start of this project, the average turn-around-time for property crimes, from submission of a work request until completion of the lab report, was approximately 125 workdays and the average turn-around-time from submission of a work request to completed report for violent/major offenses was approximately 89 workdays. OCCL Property Crime High Volume DNA Platform statistics from April 1, 2011 to March 31, 2012 indicate that the average turn-around-time for property crimes, from submission of a work request until completion of the lab report, is now 114 workdays compared to 125 workdays at the start of the project in October 2009. The average turn-around-time from the submission of a work request to a completed report for violent/major offenses is now 62 workdays compared to 89 workdays at the end of 2009.

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Executive Summary

In 2005, the OCCL, the OCDA and the Orange County Sheriff's Department participated in the NIJ DNA Expansion Demonstration Project. The purpose of the NIJ DNA Expansion Demonstration Program was to scientifically assess the contributions that DNA could make to solving high volume crimes and to identify cost-effective practices for collecting, analyzing, and utilizing DNA evidence to solve these crimes. Orange County focused on swabbing and analyzing DNA from items that had been handled or touched by suspects to determine the type(s) of items that more frequently provided probative DNA profiles.

Five hundred property crimes were analyzed by the OC Crime Lab during this program. Ninety percent of the evidence submitted and analyzed consisted of swabs from touched and handled items. Three percent was blood evidence and seven percent was items left behind at the scene by a suspect and included gloves, tools, cigarette butts, gum, and drink containers. Out of the 500 cases, 121 DNA suspect profiles were obtained and uploaded into CODIS which resulted in 24 SDIS DNA hits and seven LDIS unsolved to solved case hits.

The NIJ DNA Expansion Demonstration Project emphasized the need for case investigators, rather than CSI personnel, to submit work requests to the crime laboratory. Police investigators are more knowledgeable about all facets of an investigation and can, therefore, provide detailed case information and evidence descriptions to forensic scientists. Additionally, case investigators can ensure that victim elimination standards are collected contemporaneous to the processing of a crime scene.

In late 2006, the OCDA initiated a DNA property crime project in conjunction with the police departments of two of Orange County's larger cities. Utilizing the lessons learned from the NIJ DNA Expansion Demonstration Project and the information gleaned from a research

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visit to the United Kingdom to study and evaluate methods of triaging property crime cases, the OCDA designed and implemented a DNA property crime project with the specific intent of improving the triage process used to review property crime cases prior to DNA analysis.

The OCDA Property Crime DNA Program included two major components: Training for all project personnel, and a triaging process that required the participation of prosecutors, police investigators and lab analysts.

The OC Property Crime DNA Program

To meet the projected demand for DNA analysis, Orange County studied options to increase the efficiency and capacity of the OCCL to process crime scene samples. The NIJ DNA Expansion Demonstration Project highlighted the need for the OCCL and the OCDA to be part of the review and screening of cases before analysis. Prior to the start of the 2009 Property Crime Program, the OCCL accepted all DNA work requests and then determined if DNA was present in sufficient quantity for typing. If sufficient DNA was present, the OCCL would then contact the police agency to obtain more detailed case information and victim elimination standards. Often, completed DNA analysis was rendered useless when case circumstances did not support prosecution or the upload of a DNA profile into CODIS; investigators did not have time to go back and collect all necessary victim elimination samples, or victims were no longer desirous of prosecution due to the long passage of time since the crime had occurred.

Using an approach that can be readily adopted by other law enforcement laboratories in the forensic DNA community, Orange County designed and implemented a county-wide triage process for the acceptance and prioritization of property crime scene cases and created a “Property Crime High Volume DNA Platform” dedicated solely to the processing of biological evidence from property crimes.

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The Triage System

The triage process was divided into two distinct phases: training of law enforcement personnel and screening of property crime DNA analysis requests submitted to the lab.

Specific training goals included the following:

1. Familiarizing law enforcement personnel with new submission guidelines for property crime evidence analysis requests.
2. Providing instruction regarding the documentation required for submitting property crime requests including use of a new property crime evidence collection and screening form; the initial police agency incident report and the lab's evidence work request form.
3. Teaching law enforcement personnel to evaluate and prioritize biological evidence from property crime scenes with the goal of obtaining those samples most likely to yield the "best forensic opportunities."
4. Explaining the definition and use of elimination samples and the necessity that elimination samples be collected in most property crime cases.

Screening of property crime analysis requests was structured so that a deputy district attorney and senior forensic scientist met to review property crime DNA analysis request forms. The review process included the following: 1) Verification that all supporting and necessary documentation was attached; 2) Review of reports to determine whether the case would provide a viable investigative lead; and 3) Final prioritization of the evidence samples collected. At the conclusion of the weekly triage process, the cases ready for analysis were advanced in the laboratory's information management system (LIMS) and assigned to a DNA analyst. Cases needing further investigation were documented and police agencies were immediately notified of

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case status. It was originally estimated that one forensic scientist and one deputy district attorney could review approximately 15 cases per hour.

The Property Crime Triage System increased the efficiency and capability of the lab to process high volume samples by achieving two main objectives. First, it eliminated the need for forensic scientists to be in frequent communication with police agencies regarding property crimes and allowed more time for forensic scientists to analyze evidence. Second, because of the sample prioritization that occurred during triage, the forensic scientists were able to quickly begin the DNA analysis process.

Triage of property crime DNA analysis requests by both prosecutors and forensic scientists prevented unnecessary DNA analyses and ensured that the most probative DNA samples were analyzed first. The triage system permitted prompt notification to law enforcement personnel regarding the status of DNA analysis requests and/or the need for additional case information or victim/witness elimination samples. Carefully triaged cases have yielded increasing numbers of DNA hits leading to the successful prosecution of those responsible for the commission of these crimes.

The Property Crime High Volume DNA Platform

The goal of the Property Crime High Volume DNA Platform was to increase the lab's capability to process DNA evidence by efficiently utilizing the lab's limited DNA analysis resources. Orange County believed that this goal could be accomplished by the creation of a property crime DNA analysis workforce dedicated exclusively to the analysis of biological evidence from property crimes. Following a team concept, this workforce would process property crime scene samples using a highly automated DNA platform on a rotational schedule.

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The Property Crime High Volume DNA Platform instrumentation was carefully selected to take full advantage of state-of-the-art robotics and automation. Instrument purchases funded by the 2009 DNA Unit Efficiency Improvement Grant and associated matching funds included the following: thermomixers, centrifuge with plate rotor, Tecan/Prepfiler HID EVOlution Extraction Platform, Eppendorf Speed Vac (vacuum centrifuge), Qiagen Universal BioRobot, QIAgility pre- and post-PCR liquid handling robots, Biotek ELx900 absorbance microplate reader, and Applied Biosystems 3500 (8 capillary) genetic analyzer. Computers, monitors, and printers were also purchased to replace and set up new work stations in the laboratory.

The Property Crime High Volume DNA Platform was organized in teams consisting of four (4) full-time analysts. One half-time analyst would assist the teams as needed to complete scheduled tasks. The original proposed work schedule was staggered. The second team would begin on "day two" of the first team's schedule and a third team (if formed) would begin on "day three" of the first team's schedule. During a five day rotational block, each team would complete the following tasks:

Day One – The first team of four (4) analysts begins and conducts evidence screening of ten (10) cases per analyst (four casework samples and reference sample). The team would produce two (2) case work batches of seventy-six (76) samples each and begin digestion of these batches.

Day Two – The first team completes DNA extraction, quantitation, amplification and 3130 set-up. The second team begins Day One tasks and follows the five day schedule.

Day Three – The first team conducts QC CE run, GMID X first and second calls and begins data analysis and report writing. The third team, if formed, begins Day One tasks and follows the five day schedule.

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Day Four – The first team performs basic lab duties, completes data analysis and report writing. If time permits, the first team begins evidence screening for future batches.

Day Five – The first team completes all analyses, writes reports, technically reviews reports, and performs instrument cleaning and maintenance.

A key feature of the OCCL Property Crime High Volume DNA Platform was the ability to scale the size of the program to meet law enforcement demand for DNA processing of property crimes. Using the proposed instrumentation platform and work schedule, if three teams of four (4) forensic scientists per team, with the assistance of two (2) half-time forensic scientists, were created, the total number of property crime DNA samples screened, analyzed and delivered each week was estimated to be 560 property crime scene DNA sample results. Orange County believed that the "ramp up feature" of the Property Crime DNA Program would permit maximum flexibility and smart utilization of DNA resources. Additional Property Crime DNA teams and instrumentation platforms could be added in a measured manner that balances budgetary concerns and law enforcement DNA processing needs.

At the start of the project, the lab employed two supervisors, twenty-one (21) full-time analysts and four (4) half-time analysts. With grant funding, four (4) full-time analysts were hired to form one of the property crime teams. Another team was formed that consisted of four (4) currently employed DNA analysts and one (1) half-time analyst who were reassigned to the Property Crime High Volume DNA Platform. Additional support staffing consisting of one (1) Legal Property Technician, one (1) Forensic Technician and one (1) Clerical Aide/Office Specialist was also included in the grant proposal request. With the additional grant funded staff, the Property Crime High Volume DNA Platform included a total of eight (8) full-time analysts,

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one (1) half-time analyst, one (1) Legal Property Technician, one (1) Forensic Technician and one (1) Clerical Aide/Office Specialist, plus one dedicated DNA Supervisor.

Property Crime DNA Program Implementation

There were two major delays that hindered the implementation of the grant. The first was hiring and training personnel for the second team of property crime analysts during a County hiring freeze and budget crisis. The second delay was purchasing the robotics and other equipment needed to form the Property Crime Analysis Line in the laboratory. Additionally, as the grant period progressed, it became apparent that the staggered work schedule with the five day rotational block approach proposed in the initial grant solicitation underestimated the time that was necessary to complete some of the analytical processes; particularly the report writing and review steps.

Despite these obstacles, 2,214 property crime cases were analyzed between April 1, 2011 and March 31, 2012. Approximately 61% of the cases had evidence that consisted of victim owned items that had been touched or handled by the suspect. Twenty seven (27) percent of the cases included evidence items consisting of clothing, tools, and containers left behind at the scene by the suspect. Approximately 5% of the cases had saliva evidence and 7% of the cases had evidence items with blood.

Four hundred sixty two (462) suspect identifications were obtained from the DNA analyses of these cases for a hit/identification rate of 21% or one suspect identification for every five cases. Even though 61% of the cases' evidence items consisted of victim owned items that had been touched or handled by the suspect, this type of evidence accounted for 21% percent of the suspect identifications. Blood evidence resulted in for 25% of the CODIS hits, saliva had a 15% identification rate, and items left behind by a suspect resulted in 40% of the CODIS hits.

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The implementation of the Property Crime High Volume DNA Platform and Triage System has reduced the turn-around-time for the acceptance and DNA analysis of property crime cases and also reduced the turn-around-time for violent/major offense cases. Property Crime DNA Program statistics from April 1, 2011 to March 31, 2012 indicate that the average turn-around-time for property crimes, from submission of a work request until completion of the lab report, is now 114 workdays compared to 125 workdays at the start of the project in October 2009. Once a property crime work request is accepted following the triage process, the average turn-around-time for a case to be processed in the laboratory is 74 workdays. The average turn-around-time from the submission of a work request to a completed report for violent/major offenses is now 62 workdays compared to 89 workdays at the end of 2009.

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I. Introduction

The OCDA conducted an assessment of the County's needs for DNA analysis in 2008 (see Attachment A "Orange County Forensic DNA Assessment Study: An Evaluation of the DNA Analysis Requirements of the County's Law Enforcement Agencies"). Two clear trends emerged from the DNA Assessment Study. First, Orange County law enforcement agencies were increasingly adopting policies and procedures to more fully utilize forensic DNA technology to solve both serious and high volume crimes. Second, there was a strong expectation that DNA collection from property crimes, such as burglaries and vehicle thefts, would increase significantly in the next few years and contribute to the growing backlog of cases awaiting DNA analysis.

Utilizing DNA analysis to solve property crimes simply makes good sense. DNA analysis of property crimes enhances public safety by providing law enforcement with a powerful tool to solve and prevent property crime. Moreover, solving property crime through forensic DNA analysis will also stop or delay the escalation of criminality from the commission of property offenses to the perpetuation of violent crime.

In a Florida study, fifty-two percent of database hits against murder and sexual assault cases matched individuals who had prior convictions for burglary.[1] NIJ researchers have concluded that there is a higher recidivism rate among those who commit property crimes compared to other types of offenses and that property crime offenders often demonstrate a potential to engage in more serious, violent behavior. Analyzing DNA evidence from property

[1] Zedlewski, Edwin, et al., "DNA Analysis for Minor Crimes: A Major Benefit for Law Enforcement" NIJ Journal Issue no. 253 (January 2006) : 4.

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crimes is a necessity since the greatest danger posed by property crime offenders is their potential to commit more serious and violent crimes.[2]

The "Orange County Forensic DNA Assessment Study" forecasted that the Orange County Crime Laboratory ("OCCL") would see a significant increase in the demand for DNA analysis of both violent and non-violent high volume crimes and, unless a solution was found, a resultant increase in the backlog of both types of cases awaiting analysis.

Not surprisingly, the problems and challenges facing the DNA forensic laboratory in Orange County mirror those of other law enforcement laboratories in the nation. In 2004, Lovrich, *The National Forensic DNA Study Report,* determined that there was a backlog of over one-half million criminal cases containing unanalyzed DNA evidence.[3] A January 2008 National Institute of Justice report states, "Laboratories report that they do not have the staff to complete all service requests or the budget to hire new employees."[4]

Indeed, DNA collection from property crime scenes such as burglaries and vehicle thefts has continued to increase significantly in recent years in Orange County, California. The Orange County Crime Laboratory ("OCCL") has seen a 315 percent or 3-fold increase of property crime DNA analysis requests from 2006 to present. This drastic increase in the number of property crime DNA analysis requests in Orange County is explained, in part, by the complete acceptance and recognition of police agency investigators that DNA database technology solves crime. Forensic DNA analysis, a technology that was once reserved to solve only the most serious and

[2] Zedlewski, Edwin, et al., "DNA Analysis for Minor Crimes: A Major Benefit for Law Enforcement" NIJ Journal Issue no. 253 (January 2006) : 3.
[3] Lurch, Nicholas P., et al., *National Forensic DNA Study Report,* (Pullman, WA: Washington State University and London: Smith Alling Lane, February 2004) 3.
[4] United States, National Institute of Justice, Forensic Sciences: Increasing Efficiency in Crime Laboratories (Washington, DC: US DOJ, NIJ, January 2008) NCJ 220336.

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violent cases, is now routinely requested by police investigators in Orange County to solve property crimes.

To meet this projected demand for DNA analysis, Orange County studied options to increase the efficiency and capacity of the OCCL to process crime scene samples. In 2005, the OCCL, the Orange County District Attorney's Office ("OCDA") and the Orange County Sheriff's Department participated in the NIJ DNA Expansion Demonstration Project. The purpose of the NIJ DNA Expansion Demonstration Program was to scientifically assess the contributions that DNA could make to solving high volume crimes and to identify cost-effective practices for collecting, analyzing, and utilizing DNA evidence to solve these crimes.

Five jurisdictions were selected to participate in the program. Each jurisdiction selected distinct approaches to the collection of evidence in the field and the analysis of DNA evidence. Orange County collected all biological evidence found at burglary scenes in one specific area of Orange County and focused on swabbing items that had been handled or touched by suspects. Funds from this project were used to hire five new DNA analysts, a forensic technician, and two forensic specialists for the field. Five hundred property crimes were analyzed by the OC Crime Lab during this program. Ninety percent of the evidence submitted and analyzed were swabs from touched and handled items; three percent was from blood evidence; and seven percent was from items left behind at the scene by a suspect. Out of the 500 cases, 121 DNA profiles were obtained and uploaded into CODIS which resulted in 24 SDIS DNA hits and seven LDIS unsolved to solved case hits.

From this project, Orange County gained a greater understanding of the following:

- The need to gather detailed case information and evidence descriptions prior to accepting work requests in the laboratory;

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- The importance of collecting victim elimination standards at the time crime scenes are being processed; and
- The benefits of insisting that detectives submit work requests to the laboratory, rather than CSI personnel or first responders.

At the start of the Property Crime DNA Program, OCCL accepted all DNA work requests with the intention of determining if DNA was present in sufficient quantity for typing as a first step. If sufficient DNA was present, the submitting agency would be contacted to obtain detailed case information and victim elimination standards. OCCL determined that most of the time case circumstances would not support uploading a DNA profile into CODIS; much of the evidence collected was not probative; and that obtaining necessary elimination samples, if not collected during the initial CSI, was rarely possible or that victims were no longer willing to support prosecution after a long delay.

Another lesson learned from participation in the NIJ DNA Expansion Demonstration Project was the need for police investigators, the OCCL and the OCDA to be a part of the review or screening process of property crime cases before they are analyzed. During the NIJ DNA Expansion Demonstration Project, a deputy district attorney and a police sergeant evaluated each case from a legal and factual perspective. This evaluation included an assessment as to whether the case was prosecutable. A supervising forensic scientist evaluated the evidence collected from a scientific perspective and also helped determine whether victim elimination standards were required.

In late 2006, the OCDA initiated a DNA property crime project in conjunction with the police departments of two of Orange County's larger cities; the Santa Ana Police Department and the Anaheim Police Department. The OCDA DNA property crime project included two

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major components: Training for all project personnel, and a triaging process that required the participation of prosecutors, police investigators and lab analysts. During the triage process, a number of objectives were accomplished: first, reports were reviewed to decide if the case was prosecutable; second, the evidence collected was evaluated and samples selected for DNA analysis were prioritized; and third, a determination was made as to whether elimination standards were needed. Any case deficiencies were discussed during this triage process and follow-up work was assigned.

Orange County realized that a novel approach was needed to address a projected law enforcement demand for property crime DNA analysis services. In conjunction, the OCCL and OCDA carefully examined the policies and procedures that were in place for the collection, submission and processing of crime scene biological evidence samples to determine the approach that would be needed to meet the County's increasing demand for DNA testing.

The OCCL focused on the differences that exist between the collection, screening and processing of biological evidence collected from violent versus property crime offenses. The screening and analysis of evidence from violent crime scenes requires substantial analyst time and often involves the examination of numerous items of evidence and DNA processing of dozens of crime scene samples. In contrast, due to OCCL submission guidelines, DNA analysis of property crime evidence is less costly since it usually involves three (3) or fewer DNA samples per case and significantly less analyst time as agencies were encouraged to swab evidence themselves and submit the swabs to the lab for analysis. The OCCL's 2008 statistics supports this contention: Over seven thousand evidence items were submitted to the lab on 899

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violent crimes cases compared to approximately thirty-eight hundred items submitted on 1,023 property crimes.[5]

Drawing upon earlier experiences involving the triaging of DNA cases, the OCCL and the OCDA realized that the goal of improving the lab's capability to efficiently process an increased number of DNA samples could be made more effective when partnered with the restructuring of the lab's case submission process and the implementation of a triage system for all property crime DNA analysis requests submitted to the lab.

The Property Crime Triage System

Using an approach that could be readily adopted by other law enforcement laboratories in the forensic DNA community, Orange County designed and implemented a county-wide triage process for the acceptance and prioritization of property crime scene cases and created a "Property Crime DNA Program" dedicated solely to the processing of biological evidence from property crimes.

The triage process was divided into two distinct phases: Training of law enforcement personnel, and screening property crime DNA analysis requests submitted to the lab. Screening of property crime analysis requests was structured so that a deputy district attorney and senior forensic scientist met to review property crime DNA analysis request forms. The review process was to include the following steps: 1) Verification that all supporting and necessary documentation was attached; 2) Review of reports to determine whether the case would provide a viable investigative lead; and 3) Final prioritization of the evidence samples collected.

At the conclusion of the weekly triage process, the cases ready for analysis would be advanced in the laboratory's information management system (LIMS) and assigned to a DNA

[5] Source: Orange County Crime Lab, Preparation for Diagnostic Review: Search Results, (December 2008.)

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analyst. Cases needing further investigation would be documented and police agencies immediately notified of case status. Cases would be rejected when the forensic evidence would not provide a viable investigative lead, the case was already adjudicated or the crime was a misdemeanor offense. It was originally estimated that one forensic scientist and one deputy district attorney could review approximately 15 cases per hour.

The Property Crime Triage System was expected to increase the efficiency and capability of the lab to process high volume samples by achieving two main objectives. First, it would eliminate the need for forensic scientists to be in frequent communication with police agencies regarding property crimes and allow more time for forensic scientists to analyze evidence. Second, because of the sample prioritization that would occur during triage, the forensic scientists would be able to quickly begin the DNA analysis process.

Orange County believed that triage of property crime DNA analysis requests by both prosecutors and forensic scientists would prevent unnecessary DNA analyses and ensure that the most probative DNA samples were analyzed first. The triage system would provide prompt notification to law enforcement personnel regarding the status of DNA analysis requests and/or the need for additional case information or victim/witness elimination samples. Carefully triaged cases were thought to yield increasing numbers of DNA hits which would lead to the successful prosecution of those responsible for the commission of these crimes.

The Property Crime High Volume DNA Platform

The OCCL also recognized that the expansion of the lab's capability to process property crime scene evidence could be accomplished through the implementation of a property crime DNA analysis platform that included automated instrumentation and the introduction of a team concept approach to perform necessary tasks. Using this approach, the OCCL estimated that

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there would be a reduction in the average turn-around-time (from the submission of a DNA analysis to a completed report) from 125 workdays to approximately 25 workdays for property crime as well as a decrease of the number of property crime samples in the DNA section's case backlog.

The goal of the Property Crime High Volume DNA Platform was to increase the lab's capability to process DNA evidence by efficiently utilizing the lab's limited DNA analysis resources. Orange County believed that this goal could be accomplished by the creation of a property crime DNA analysis workforce dedicated exclusively to the analysis of biological evidence from property crimes. Following a team concept, this workforce would process property crime scene samples using a highly automated DNA platform on a rotational schedule.

The Property Crime DNA Program proposed instrumentation platform was carefully selected to take full advantage of state-of-the-art robotics and automation. Instrument purchases funded by the 2009 DNA Unit Efficiency Improvement Grant and associated matching funds included the following: thermomixers, centrifuge with plate rotor, Tecan/Prepfiler HID EVOlution Extraction Platform, Eppendorf Speed Vac (vacuum centrifuge), Qiagen Universal BioRobot, QIAgility pre- and post-PCR liquid handling robots, Biotek ELx900 absorbance microplate reader, Applied Biosystems 3500 (8 capillary) genetic analyzer, and additional computer workstations for the laboratory.

At the start of the project, the lab employed two supervisors, twenty-one (21) full-time analysts and four (4) half-time analysts. With grant funding, four (4) full-time analysts would be hired to form one of the property crime teams. A total of eight (8) full-time analysts and one (1) half-time analyst would be assigned exclusively to the processing of DNA samples from property crime cases. Additional support staffing consisting of one (1) legal property technician,

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one (1) forensic technician and one (1) clerical aide/office specialist was also included in the grant proposal request. The proposed work schedule was initially staggered. The second team would begin on "day two" of the first team's schedule and a third team (if formed) would begin on "day three" of the first team's schedule. The staggered schedule is discussed in more detail in Project Results, Section B, "Property Crime DNA Program".

A key feature of the Orange County Crime Laboratory Property Crime High Volume DNA Platform is the ability to scale the size of the program to meet law enforcement demand for DNA processing of property crimes. The "ramp up feature" of the Property Crime High Volume DNA Platform offers maximum flexibility and smart utilization of DNA resources. Additional Property Crime DNA teams and instrumentation platforms may be added in a measured manner that balances budgetary concerns and law enforcement DNA processing needs. As well, smaller laboratories or those operating under severe budget constraints could realize significant gains in DNA processing efficiency and the reduction of backlogs using the triage system adopted by Orange County.

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I. Project Design and Methods

Orange County's objective was to increase the efficiency and capacity of the OCCL to process crime scene samples from property crimes. To accomplish this goal, Orange County designed and implemented a Triage System for property crime cases and created a Property Crime High Volume DNA Platform dedicated solely to the processing of biological evidence from property crimes. Orange County relied heavily upon experience gained from earlier projects involving property crime case submission and triage to implement these processes.

A. Property Crime Case Submission and Triage System

1. Law Enforcement Agency Training

OCCL and OCDA jointly provided training to each police agency within the County during the summer of 2009. Specific training goals included the following:

1. Familiarizing law enforcement personnel with new submission guidelines for property crime evidence analysis requests.
2. Providing instruction regarding the documentation required for submitting property crime requests including use of a new property crime evidence collection and screening form (this form was archived when OCCL's Work Request Case Status website came online that allowed police department personnel to directly input required information), the initial police agency incident report, and the lab's evidence work request form.
3. Teaching law enforcement personnel to evaluate and prioritize biological evidence from property crime scenes with the goal of obtaining those samples most likely to yield the "best forensic opportunities."

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4. Explaining the definition and use of elimination samples and the necessity that elimination samples be collected in most property crime cases.

Additional updated training was provided throughout the time period of this grant whenever requested by the police department or deemed necessary based upon the quality of the police agency's property crime work request submissions.

2. Screening Triage Cases

Prior to the implementation of the Property Crime Triage System in September 2009, OCCL accepted and attempted to process all DNA analysis requests submitted by an agency. This open acceptance policy, at times, resulted in the utilization of limited resources with no beneficial end result. Instead the following frequently occurred: The analysis of non-probative crime scene evidence samples; analysis of evidence from cases that had already been adjudicated or rejected for criminal filings by the OCDA; or the unnecessary analysis of probative evidence samples that were not needed because of the vast quantity of forensic and non-forensic evidence that already existed to support a prosecution. Since prosecutors are required to evaluate all information contained in police and lab reports in order to determine whether a criminal case should be filed against an individual, they are often in the best position to decide if DNA analysis is necessary and to determine whether sample analysis might yield necessary probative DNA results.

Just prior to September 2009, OCCL had 1,860 pending property crime DNA analysis requests. OCCL provided all of the pending requests to OCDA DNA Unit deputy district attorneys for evaluation. The OCDA returned the following types of requests to submitting agencies and the OCCL classified these cases as rejections in the laboratory LIMS:

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- Case facts and/or existing law would not support prosecution even if DNA analysis was conducted;
- A criminal case had already been filed and/or adjudicated without corroborating DNA evidence; and
- Further investigation was necessary before the case could be reviewed for filing.

Approximately 65% (1,238) of the 1,860 property crime DNA analysis requests were returned to the submitting agencies. The remaining requests, if they indicated that probative evidence samples were collected, provided sufficient factual information and stated that necessary elimination samples existed, were returned by OCDA to the OCCL for DNA analysis acceptance.

In September 2009, a property crime triage team was formed, consisting of one OCCL DNA Section forensic scientist (supervisor), two OCDA DNA Unit deputy district attorneys, and one OCDA DNA Unit paralegal. The team met once a week in person to review and triage paper copies of work requests, property crime evidence forms, and police reports. The work requests and police reports were reviewed to determine if a case would be prosecutable if a probative DNA profile was obtained and a suspect could be identified based on the information provided. Many of the initial work request submissions included victim owned items that had been handled by a suspect where there was the expectation that victim DNA would be present. On this type of evidence, the work requests were not accepted by the triage team until all of the elimination reference samples from the victims were submitted.

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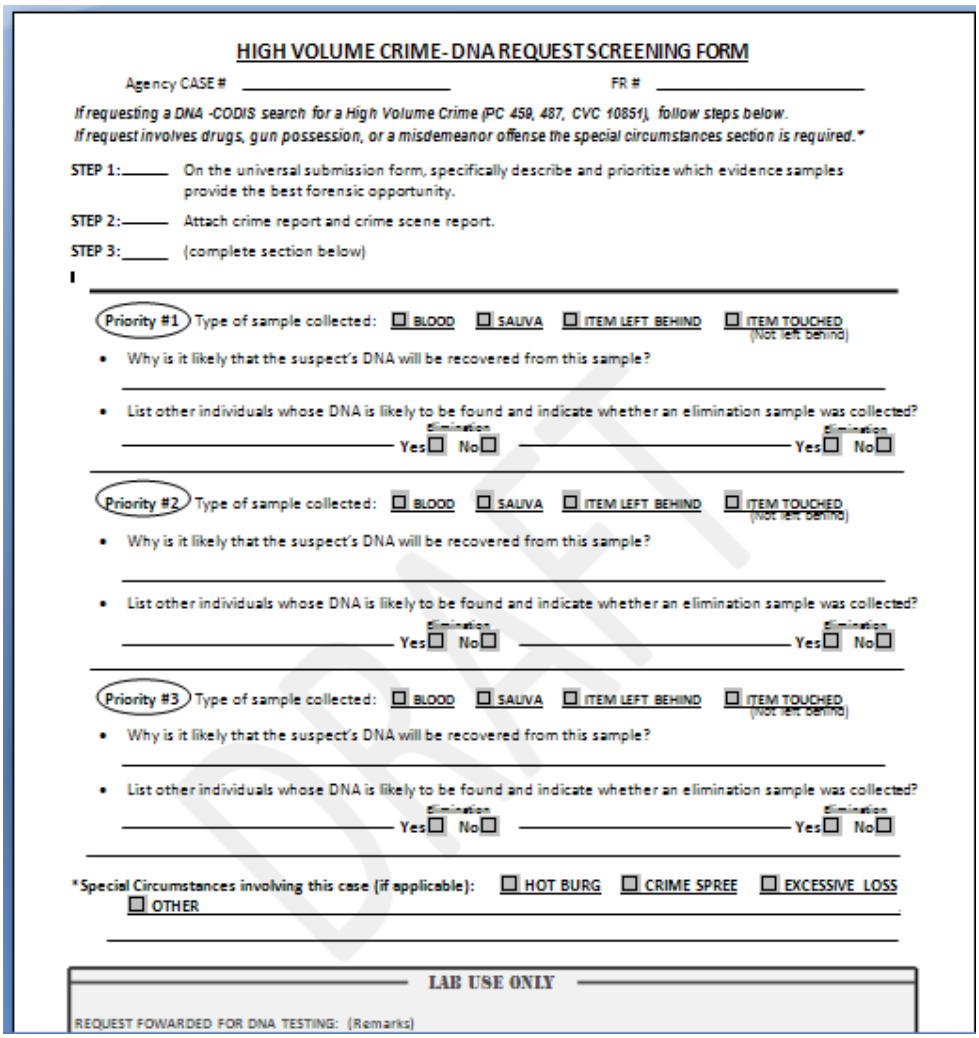

HIGH VOLUME CRIME- DNA REQUEST SCREENING FORM

Agency CASE # _____ FR # _____

If requesting a DNA -CODIS search for a High Volume Crime (PC 459, 487, CVC 10851), follow steps below.
*If request involves drugs, gun possession, or a misdemeanor offense the special circumstances section is required.**

STEP 1:____ On the universal submission form, specifically describe and prioritize which evidence samples provide the best forensic opportunity.

STEP 2:____ Attach crime report and crime scene report.

STEP 3:____ (complete section below)

Priority #1 Type of sample collected: ☐ BLOOD ☐ SALIVA ☐ ITEM LEFT BEHIND ☐ ITEM TOUCHED (Not left behind)

- Why is it likely that the suspect's DNA will be recovered from this sample?
- List other individuals whose DNA is likely to be found and indicate whether an elimination sample was collected?

_____ Yes☐ No☐ (Elimination) _____ Yes☐ No☐ (Elimination)

Priority #2 Type of sample collected: ☐ BLOOD ☐ SALIVA ☐ ITEM LEFT BEHIND ☐ ITEM TOUCHED (Not left behind)

- Why is it likely that the suspect's DNA will be recovered from this sample?
- List other individuals whose DNA is likely to be found and indicate whether an elimination sample was collected?

_____ Yes☐ No☐ (Elimination) _____ Yes☐ No☐ (Elimination)

Priority #3 Type of sample collected: ☐ BLOOD ☐ SALIVA ☐ ITEM LEFT BEHIND ☐ ITEM TOUCHED (Not left behind)

- Why is it likely that the suspect's DNA will be recovered from this sample?
- List other individuals whose DNA is likely to be found and indicate whether an elimination sample was collected?

_____ Yes☐ No☐ (Elimination) _____ Yes☐ No☐ (Elimination)

*Special Circumstances involving this case (if applicable): ☐ HOT BURG ☐ CRIME SPREE ☐ EXCESSIVE LOSS ☐ OTHER

LAB USE ONLY

REQUEST FOWARDED FOR DNA TESTING: (Remarks)

Screen Shot of the paper form for requesting High Volume Crime DNA work

The weekly committee based meetings continued until a web-based work request submission system was created by OCCL staff in April, 2010. The new web based system was called the Work Request and Case Status ("WRCS") site. Successful implementation of the WRCS website required the participation of laboratory staff, police detectives and prosecutors. Police agency personnel and triage team members learned how to submit, review, prioritize and accept work requests electronically. Police agency training was provided in April 2010 and law enforcement personnel were encouraged to use and become familiar with the work request

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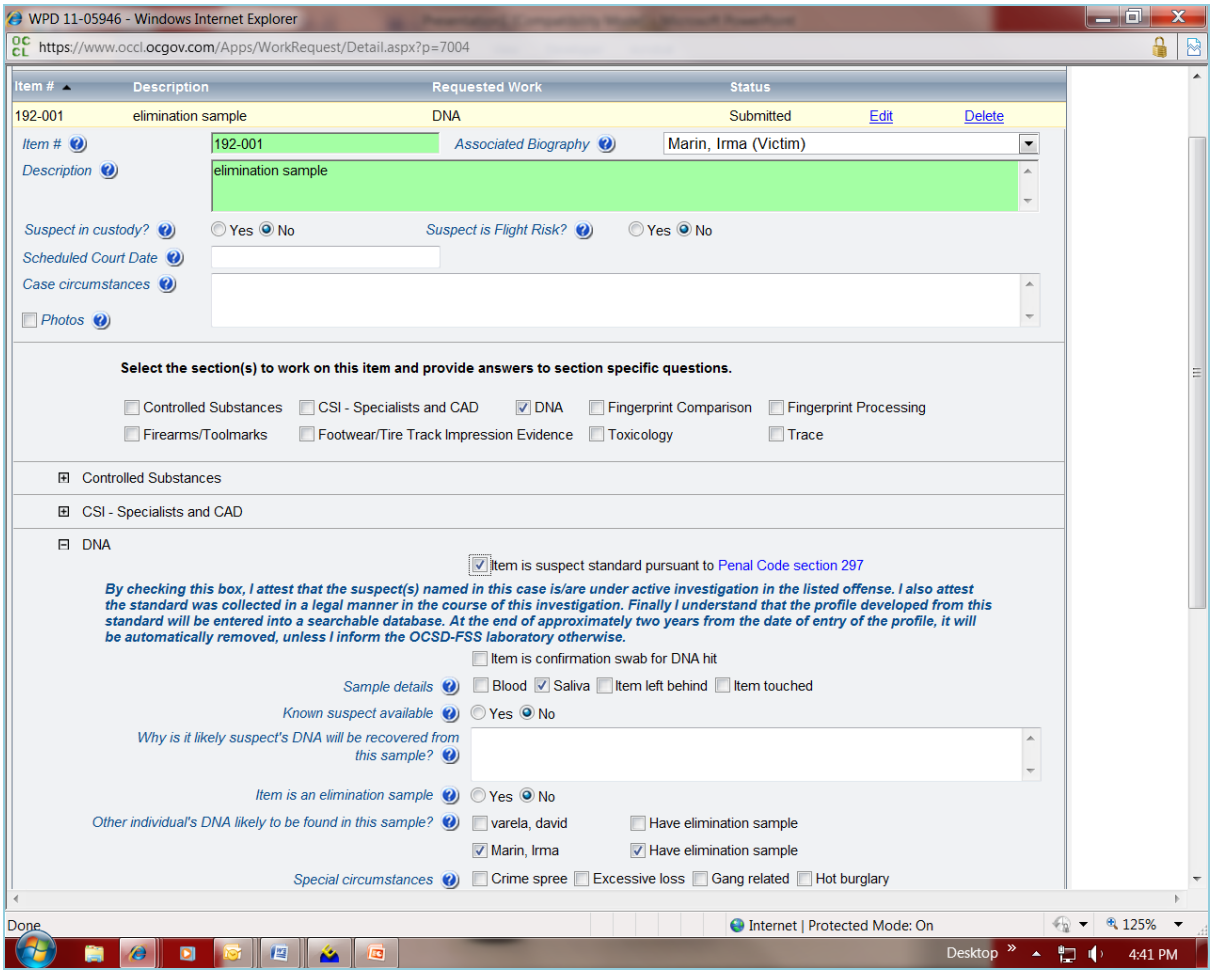
website over the summer of 2010. Agencies had the option of submitting work requests by fax (the old way) or though the new website from April-November 2010.



Screen Shot of the WRCS website form for requesting High Volume Crime DNA work

Mandatory use of the website for all laboratory work requests began on November 1, 2010. After this date, paper or faxed work requests were no longer accepted by the laboratory and triage of property crime work requests was no longer conducted during in person meetings. OCDA and OCCL DNA personnel reviewed and triaged property crime DNA analysis work requests through the WRCS website. Any issues, concerns or follow-up investigation, including

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the need to obtain elimination samples, were relayed to case detectives through this website. Correspondence entered onto the website was delivered to the investigators by e-mail and an audit trail was created and attached to the case submission. OCDA and OCCL personnel conducted final prioritization of samples collected for each prosecutable case before approving the case and advancing it into LIMS for scheduling and analysis.

During triage, the list of evidence collected for each case was closely examined by OCDA and OCCL personnel. Cases lacking "best forensic opportunity" crime scene samples were returned to police agencies with appropriate feedback. For work requests that indicated the collection of at least one or more "best forensic opportunity" crime scene samples, OCDA and OCCL personnel prioritized the evidence listed using the number "1" to designate the sample that appeared to be the very "best forensic opportunity," the number "2" for the next "best forensic opportunity," and so forth. For any property crime case, no more than three crime scene evidence items or four victim elimination references would be routinely accepted for testing.

Generally, work requests that indicated probative blood or saliva evidence was collected or possible suspects were identified were queued first for DNA analysis. Work requests that indicated the collection of personal property left behind by a suspect such as tools, an item of clothing or a hat were placed next in queue. Cases that contained evidence belonging to the victim(s) that had been apparently touched or handled by a suspect were placed last in queue as long as the proper victim elimination standards were collected and listed on the work request form.

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B. Property Crime High Volume DNA Platform

1. Hiring of Staff

At the start of the project, Orange County, and in particular the Orange County Sheriffs' Department, was experiencing severe budget shortfalls due to unpredicted decreases in property and sales tax revenue in 2008-2009, which carried over into the 2010-2011 fiscal year. Multiple layers of budget cuts, layoffs, and hiring freezes occurred during this time period. The crime lab was notified that forensic scientist, forensic specialist, and support staff position layoffs would be necessary. In anticipation of these layoffs, the OCCL delayed the hiring of grant funded positions for 6 months. Since County rules permitted rehiring of laid off employees even during a hiring freeze, several non-DNA forensic scientists with low seniority attended classes in molecular biology and genetics in hopes of obtaining a DNA grant funded position.

OCCL believed that rehiring employees who had already successfully passed background and, in some cases, a probationary period would offset any delay caused by not immediately beginning the hiring process for grant funded positions. However, between October 2009 and April 2010, retirements and the transfer of support personnel to other divisions obviated the need for lab layoffs. The decision to delay recruitment for grant funded positions due to the County's tumultuous and bleak economic forecast was, therefore, in hindsight, not the optimal course of action.

Recruitment for forensic scientists and a forensic technician began in April 2010 which resulted in two employees being promoted to scientists in June 2010 and two scientists and a technician hired as new employees in August 2010. An office specialist to assist in the DNA Unit and a legal property technician were hired off of the department lay-off list in April and May 2010.

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Seven staff members were hired for the Property Crime DNA Program, including four (4) forensic scientists, one (1) forensic technician, (1) clerical aide/office specialist (hereafter referred to as office specialist) and one (1) legal property technician. The forensic technician, legal property technician and office specialist were support personnel for the DNA Section. The four forensic scientists were hired to work exclusively on the DNA Property Crime Project.

2. Training DNA Analysts

Four new Forensic Scientists were hired using grant funds. Each of these scientists met the minimum educational requirements to be a DNA Analyst but none had forensic DNA experience. OCCL DNA analysts typically take eighteen to twenty four months to become fully trained. The OCCL approach to training divided the steps of the DNA analytical process into four modules: evidence handling and processing; DNA extraction and quantitation; amplification and robot set-up; and DNA typing, data analysis and report writing. Each analyst was required to train and qualify to perform casework duties in the first module, evidence handling and processing, before they could move on to the next module. After demonstrating proficiency in a module, the analyst was assigned casework related to what was learned in the particular module for three to six months to gain experience and reinforce the training. There was some overlap between the modules since the analysts were called to perform steps of casework processing for one module while beginning the reading and preliminary training steps for the next module.

To accelerate the training process and minimize the impact on existing staff, OCCL contacted one of the training coordinators at Marshall University Forensic Science Center (MUFSC) in March 2010 to set-up basic DNA training for our new analysts. Marshall University had just completed a two week training module with West Palm Beach where MUFSC presented

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lectures on molecular biology and provided laboratory instruction on basic forensic DNA analysis using their state of the art training laboratory. Funding delays and analyst's schedules (three out of the four were attending graduate school courses at night) prevented our analysts from attending basic DNA training at MUFSC. Subsequently, however, the four analysts attended a one week Advanced DNA training course at MUFSC as well as a DNA Extraction and Quantitation class, Courtroom Testimony class, Population Genetics, and an Ethics class from the California Department of Justice's Criminalistics Institute (CCI). The analysts also received one-on-one training from DNA mentors and had in-house lectures that were presented by senior staff at OCCL throughout the duration of the project.

3. Equipment Purchase and Validation

In 2004, the OCCL incorporated a batch processing system in the laboratory that is managed by the LIMS and a DNA Manager Program. Both the LIMS and DNA Manager Program were created by OCCL staff to increase the ease of implementing new robotic liquid handling and multi-channel capillary electrophoresis instruments into the DNA analysis flow.

2009 DNA Unit Efficiency Improvement Grant and matching County funds allowed the laboratory to purchase and add new state of the art robotic extraction and liquid handling instruments and a multi-capillary Genetic Analyzer to decrease turn-around-times and increase productivity. Grant and match funded purchases included: thermomixers (4) that are used in the initial extraction steps of the DNA isolation procedure; a centrifuge with plate rotor used in the initial extraction steps of the DNA isolation procedure; a Tecan/Prepfiler HID EVOlution Extraction System used to separate and purify DNA from other cellular components; an Eppendorf Speed Vac (vacuum centrifuge) used to dry down plates at the end of the

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Tecan/Prepfiler extraction process so they can be reconstituted with standard volumes; a Qiagen Universal BioRobot for pre-PCR liquid handling that was used to set up quantitation and amplification plates; two QIAgility post-PCR liquid handling robots used to set up Genetic Analyzer plates; one QIAgility pre-PCR robot to add liquid Biomatrica DNA Stable to remaining DNA extracts; a Biotek ELx900 absorbance microplate reader used to calibrate the syringes of the liquid handling robots in the post-PCR area; and the Applied Biosystems 3500 (8 capillary) Genetic Analyzer. Additional computers, monitors, and printers were also purchased to replace and set-up additional work stations in the laboratory areas of the DNA Section.

Funds from the 2008 DNA Backlog Reduction/Capacity Enhancement Program Grant were used to hire an outside resource to assist with the validation of a Tecan HID EVO 150 extraction robot with Prepfiler chemistry. 2009 DNA Unit Efficiency Improvement Grant funding was used to provide overtime funds for analysts to validate the new Genetic Analyzer (3500), validate a new typing system (Identifiler Plus), investigate the feasibility of implementing Biomatrica DNA Stable into our High Volume Line and evaluate a new push-off tip swab for DNA collection.

4. Work Flow and Scheduling

The Property Crime DNA Program was organized in teams consisting of four (4) full-time analysts. One half-time analyst was assigned to aid in the completion of scheduled tasks. The work schedule described in the original grant proposal was staggered. The second team would begin on “day two” of the first team’s schedule and a third team (if formed) would begin on “day three” of the first team’s schedule. During a five day rotational block, each team would complete the following tasks:

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Day One – The first team of four (4) analysts begins and conducts evidence screening of ten (10) cases per analyst (four casework samples and reference sample). The team would produce two (2) case work batches of seventy-six (76) samples each and begin digestion of these batches.

Day Two – The first team completes DNA extraction, quantitation, amplification and 3130 set-up. The second team begins Day One tasks and follows the five day schedule.

Day Three – The first team conducts QC CE run, GMID X first and second calls and begins data analysis and report writing. The third team, if formed, begins Day One tasks and follows the five day schedule.

Day Four – The first team performs basic lab duties, completes data analysis and report writing. If time permits, the first team begins evidence screening for future batches.

Day Five **–** The first team completes all analyses, writes reports, technically reviews reports, and performs instrument cleaning and maintenance.

With the selection, purchase, and implementation of the robotic extraction system, OCCL realized that the staggered work schedule was not tenable. A Tecan HID EVO 150 with Prepfiler Chemistry was the robotic extraction system selected to extract the majority of the evidence swabs. Manuel organic extraction procedures that were in use at the time of the grant proposal staggered schedule was prepared had to be transitioned to an extraction procedure that could not complete sample processing in the time originally estimated extending the later processes. This, plus the failure to account for the increasing amount of time needed to testify in court on property crime cases due to the increased number of analysis that resulted in more DNA hits, the requirement of Melendez-Diaz testimony from all analysts participating in the high volume team batching process, and the increasing number of confirmation standards that required analysis,

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resulted in the realization that a strict weekly schedule was not feasible due to the flexibility and variation that existed from week to week. These issues are discussed in further detail under Project Results, Property Crime High Volume DNA Platform section.

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II. Project Results

A. Triaging Property Crime Work Requests

The triage portion of the Property Crime DNA Program included two major components: the training of all law enforcement personnel in the County and the actual triage process that required the participation of prosecutors, police investigators and lab staff. Property crime work request triage began on the first of September 2009 and was structured so that two OCDA DNA Unit deputy district attorneys assisted by an OCDA Investigative Assistant and a DNA Supervisor met weekly to review and evaluate property crime cases. The deputy district attorneys reviewed the work requests and case information to evaluate the legal aspects of the case and the DNA Supervisor examined the case analytically to determine if the evidence was collected properly and whether the case information was sufficient to support DNA profiles being entered into CODIS.

The process initially began with the screening of paper work requests, property crime evidence forms, and police reports by the entire triage team. The first step of the triage process required that the OCDA Investigative Assistant check the incoming property crime work requests against the OCDA Crime Management System (CMS) to determine if a suspect had been identified by non-forensic DNA means and whether a criminal case had been filed or rejected by OCDA. A filed case was reviewed to determine whether DNA testing was necessary. A case that was rejected for filing was reviewed to determine if DNA testing might result in a viable investigative lead. In contrast, an adjudicated case was evaluated to determine if DNA results might provide exculpatory evidence.

The second step of the triage process was to examine the completeness of the submitted lab work request packets to ensure that each contained all required documentation, basic case

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information, complete evidence descriptions including a designation of evidence type and an indication that all necessary elimination standards were collected. Incomplete work requests submissions were returned to law enforcement agencies with feedback describing the additional information before the case could be resubmitted.

The third step of the process was to determine whether police agency personnel, in light of known case facts, collected and appropriately prioritized "best forensic opportunity" crime scene samples. "Best forensic opportunity" crime scene samples are probative biological evidence samples collected from objects, surfaces or other areas that are likely to yield a single source suspect DNA profile or a DNA mixture from which an appropriate major and/or minor suspect DNA profile can be deduced to provide a viable investigative lead.

In April 2010, the OCCL implemented a Work Request and Case Status ("WRCS") website that allowed police investigators to submit work requests electronically. In November 2010, it became mandatory for all Orange County police agencies to submit evidence analysis requests through the WRCS website. OCDA and OCCL DNA personnel reviewed property crime DNA analysis work requests and, through the WRCS website, related any issues, concerns or follow-up investigation, including the need to obtain elimination samples, to case detectives. All correspondence was entered into a comments field attached to that case submission and the communication log could be viewed by anyone who was authorized to log on to the WRCS system and view that case. OCDA and OCCL personnel conducted final prioritization of samples collected for each prosecutable case through the WRCS site. At the conclusion of the triage process, cases ready for analysis were advanced into the LIMS.

Prior to the advent of the WRCS, the deputy district attorneys, DNA supervisor, and investigative assistant met and worked together to review and evaluate the property crime work

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requests. With the implementation of the WRCS, the process became a more cooperative and convenient effort. OCDA DNA Unit paralegals were assigned, in lieu of the deputy district attorneys, to each work half-time on the evaluation and triage of work requests. For simple cases, the paralegal was able to "accept" a request which is then reviewed by the DNA Supervisor. If a case is complex, circumstances are unclear, or information was missing, the paralegal was permitted to contact the investigator or flag the request for a deputy district attorney to review. The DNA Supervisors reviewed the cases and "promoted" them into LIMS for scheduling and analysis.

At first, the use of the OCCL case submission system and the WRCS website met some resistance, particularly from police agency detectives who had negative experiences during their first attempts to interface with the website. These investigators were contacted and offered additional one-on-one training. Almost all law enforcement personnel now embrace the electronic work request system as a time saving tool; not only for submitting their work requests to the lab; but also for the ability of their agencies to track their work request submissions and case correspondence as well.

Follow-up training was provided to all police agencies by OCCL and OCDA personnel during the summer and fall of 2011. This additional training included specific feedback to the police agency detectives and crime scene personnel regarding property crime DNA case submissions, explained in greater detail the use of DNA evidence to solve crimes, and addressed the need for a prompt investigatory follow-up after receiving a DNA hit notification. An explanation of the types of requests that would be rejected was also provided to police agency personnel. These included situations where DNA analysis would not provide a viable

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investigative lead, insufficient DNA elimination swabs were obtained or the collection of swabs were from locations that were accessible to many individuals.

While triaging of property crime work requests continues, modifications to the WRCS website are always being made to improve user experience. Functionality will soon be added to the WRCS website to allow both investigators and prosecutors to determine the stage of analysis for every item of property crime evidence accepted by the lab. All Orange County law enforcement agencies now use the WRCS to submit lab work requests; not only for property crimes, but for major crime cases as well. Screen shots that demonstrate some of the key features of the WRCS are provided in Attachment B.

Prior to this property crime project, the OCCL did not have a mechanism to reject or return work requests back to law enforcement agencies even if the work request was incomplete or improperly filled out. As the only forensic science services provider in the County, the policy of OCCL was to accept and eventually work on each case submitted. This resulted in the creation of a large property crime backlog and approximately 85% of one forensic DNA supervisor's time was spent reviewing DNA property crime work requests and contacting the agencies to request additional information and clarification of case circumstances. It also resulted in many cases being tested where DNA profiles could not be uploaded into CODIS because victim elimination samples had not been collected and submitted.

A sample of 1,860 property crime DNA request work requests evaluated during the summer of 2009 found that 1,238 DNA request forms (65%) were incomplete or further clarification of case circumstances was necessary before effective analysis could commence. Since implementation of the triage process, and the addition of a clerical helper funded by this grant, the current "High Volume" DNA supervisor now spends approximately 2-3 hours a day

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reviewing work requests and contacting investigators through WRCS. The remainder of the supervisor's time is spent managing the training of new analysts, coordinating the validation of new equipment, creating work schedules, meeting with team members, and monitoring courtroom testimony for new staff.

Having the assistance and support of the OCDA to review and reject property crime cases that were not prosecutable or had been adjudicated and work requests that did not provide necessary crime scene and evidence information was also of great benefit to the laboratory. The triage process now puts more of the burden on the submitting agency to provide all of the necessary information and required reference samples collected before the case makes its way into the laboratory. Evaluating approximately 1,430 cases reviewed by the triage team, 55% of those cases were accepted initially while 45% were rejected. Out of the 45% rejected, approximately 20% were resubmitted by the agencies and accepted. In total, 36% of the cases submitted were ultimately rejected or 518 case submissions out of the 1,430 submitted by the agencies.

Orange County originally estimated that one forensic scientist and one senior deputy district attorney could review approximately 15 cases per hour. Instead, it was determined that, with adequate training, a paralegal is able to review the majority of the property crime case submissions without the assistance of a prosecutor. Only complex cases with difficult legal issues are forwarded by the paralegal to a senior deputy district attorney. The paralegal reviews approximately 10 property crime work requests an hour. The DNA Supervisor can each review approximately 10-20 cases an hour using the WRCS site depending on the complexity of the case. Simpler cases, such as those where a suspect left blood behind at a scene, may take only a couple of minutes to review and accept. More complex cases that contain multiple items touched

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and handled in various locations and require multiple elimination standards may take up to 10 minutes to review.

Even though 2-3 hours are spent each day by an OCDA staff member and a DNA supervisor triaging cases, the Property Crime Triage System has increased the efficiency and capability of the lab to process high volume samples by achieving three main objectives. First, it eliminated the need for forensic scientists who were conducting the DNA analyses to be in frequent communication with police agencies regarding property crimes and allowed them more time to analyze evidence. Second, because the sample prioritization occurred during triage, the forensic scientists were able to quickly begin the DNA analysis process. Third, the Triage System reduced the number of analyses that were unnecessarily performed.

Triage of property crime DNA analysis requests by both prosecutors and forensic scientists prevents unnecessary DNA analyses and ensures that the most probative DNA samples are analyzed first. The triage system permits prompt notification to law enforcement personnel regarding the status of DNA analysis requests and/or the need for additional case information or victim/witness elimination samples. The use of the WRCS website has also improved communications between the law enforcement agencies, OCDA and the Crime Lab by creating a permanent accessible audit trail for each case on WRCS that can be used by all parties to ask questions and record responses.

B. Property Crime High Volume DNA Platform

Prior to this grant, the OCCL DNA Section analyzed property crime cases as time permitted and when Backlog Reduction Program grant funding was set aside for that purpose. The laboratory's first priority was, and still is, violent crime case analysis. DNA analysts were assigned property crime cases when violent crime case backlog was down or when they were

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able to fit cases into their schedules. To address the analysis of the increasing number of property crime cases being submitted to the lab, OCCL proposed the formation of two teams of DNA analysts that would be dedicated to analyzing only property crime cases. One team would be composed of experienced DNA analysts already familiar with OCCL DNA Section procedures, and the other team would consist of newly hired analysts funded by the grant. Depending on the work load, property crime submission rate, and possible funding sources, OCCL would consider adding a third team later in the project.

The OCCL DNA Section experimented with setting up property crime teams in the past and based on those experiences believed that using dedicated teams of analysts would be the best solution to tackle our increasing property crime submissions. The OCCL participated in National Institute of Justice's (NIJ) DNA Expansion Demonstration Project in 2005-2007 and prior to that conducted an internal "mini property crime" project that directed all property crime cases to a small team of analysts. From the experience, OCCL learned that the data analysis, report writing, and report review were the bane of the process. Evidence sampling and laboratory analyses could be efficiently batched and quickly completed. However, efficiency came to a halt when it came time to interpret the data and report results.

To address these problems, the OCCL DNA Section IT staff created a report writing module in the DNA Manager portion of LIMS. The report writing module featured a template that gathered case information from LIMS, including evidence items examined, and featured drop down menus so analysts could select standard evidence and analysis descriptions and routine phrasing. DNA profiles were also imported into the report document from LIMS eliminating the need to type in DNA profiles into report charts which reduced clerical errors. Analysts had the ability to edit the final report and add in additional information when necessary.

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OCCL also standardized and streamlined reports in the DNA Section so the majority of the DNA reports were consistent in format and content which made them quicker to write and review.

1. Hiring of Staff and the Formation of Property Crime Teams

Hiring and training new staff for this project caused the first significant project delay. In October 2009, a hiring freeze was in effect in Orange County that delayed the formation of the two teams needed to work on the High Volume DNA Analysis Line. There was a threat of layoffs which resulted in a delay of the recruitment process for six months. Recruitment for four forensic scientists and a forensic technician began in April 2010 which resulted in two employees being promoted to scientists in June 2010 and two forensic scientists and a forensic technician hired as new employees in August 2010. An Office Specialist to assist in the DNA Unit and a Legal Property Technician were hired from the department's layoff list in April and May 2010.

While the budget issues were being resolved and possible layoffs were discussed, OCCL formed the first Property Crime DNA team in November 2009 from existing personnel. This first team manually extracted and profiled property crime evidence samples while they also evaluated and selected a large platform extraction robot, organized and designed the physical layout of cabinets and counters for a robot extraction room, validated the extraction robot (Tecan HID EVO 150 with Prepfiler chemistry) once it arrived, and assisted with the training of the new DNA analysts. Primarily through the efforts of the first property crime team, the equipment and instrumentation purchased for the project was validated and placed on-line for casework by the beginning of April 2011. While the first team set up the property crime analysis line and analyzed incoming casework, the second team was hired and began their training.

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As the end of the grant period approached, there were concerns among the newly hired lab staff that the County would not be able to assume the cost of funding their limited term grant funded positions. Not being able to retain the four forensic scientists who had received extensive DNA training for 18 months and became fully trained DNA analysts close to the end of the grant period would have been a tremendous loss to the laboratory. Fortunately, at the end of 2011, the County did fund the four scientist positions. The County was unable, however, to fund the support positions included in the grant. These positions included the office specialist, a forensic technician, and a legal property technician.

During the project period, there were problems retaining support personnel whose limited term positions were funded with grant matching funds from the County. The legal property technician (LPT) left for an extended family leave of absence from May-July 2011. A deputy sheriff who was on restricted work duty was temporarily hired to assist the lab's Evidence Control Unit (ECU) until the LPT returned. The benefit of using a restricted duty deputy was that no background investigation was required and the deputy, familiar with the OC Sheriff's Department's evidence collection and intake procedures, required very little training and was able to provide immediate assistance. The major drawback was that grant funds had to be utilized to pay the deputy's salary that was more than twice that of the LPT's salary.

The office specialist resigned in December 2010 and a replacement was not found until August 2011 due to the lack of candidates interested in accepting a limited term position. This resulted in the DNA Supervisor overseeing the High Volume DNA Analysis Line spending a large amount of their time accepting and printing work requests, requesting evidence from the agencies and assigning cases to analysts until a new office specialist was hired.

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The forensic technician hired for this project promoted to a forensic scientist in July 2011 and transferred to the Forensic Alcohol Section of the lab where an opening for a regular full-time forensic scientist position existed. The forensic technician had been trained in some DNA procedures and was scheduled to be promoted to a forensic scientist limited term position in the DNA Section when 2011 DNA Backlog Reduction and Capacity Enhancement Program Grant funds were awarded in October 2011. Understandably, the individual chose not to wait for the DNA Section limited term position resulting in a significant loss of DNA training resources with no offsetting gains to the DNA Section of the laboratory. Due to the length of time necessary to recruit and perform background checks, the hiring of a replacement technician was not attempted.

At the close of the project, the DNA Section consisted of one DNA laboratory director, three supervisors, twenty-two full time DNA analysts and two half-time DNA analysts. Even though four new forensic scientists were hired, the number of DNA analysts in the section did not increase because three analysts (three from major crimes and one from the high volume group) were promoted to fill four supervisor positions in the DNA, Information Technology, and Forensic Alcohol Sections of the laboratory. These positions were not backfilled.

2. Training New DNA Analysts

Four new Forensic Scientists were hired using grant funds. As mentioned earlier, each of these scientists met the minimum educational requirements to be a DNA Analyst but none had forensic DNA experience. OCCL DNA analysts typically take eighteen to twenty four months to become fully trained.

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The first procedure in which the new analysts were trained was evidence handling and processing. The analysts learned the laboratory procedures for the examination and sampling of evidence for subsequent DNA processing. Property crime cases were assigned to each of the new analysts to examine, sample and enter into the LIMS DNA Case Manager system. During this stage of their training, the new analysts collectively generated twenty extraction batches (76 samples per batch) which were stored in the laboratory freezer to await future extraction. Extraction of these samples occurred later in the project after the Tecan/Prepfiler robotic extraction system purchased and validated. Cases with evidence that had good forensic opportunities, such as blood, saliva, or items left behind by a suspect, were processed immediately by the other experienced Property Team analysts using the manual extraction process.

The analysts were next trained to perform DNA extraction using the Qiagen EZ-1 extraction robots to extract reference samples. Following the EZ-1 robot training, the analysts received training using the Tecan/Prepfiler robotic extraction system to extract body fluid and trace DNA samples from property crime evidence. After gaining experience with these two robotic extraction systems, analysts learned DNA quantitation set-up using the Qiagen Universal BioRobot liquid handling system and the OCCL in-house quantitation process.

Amplification set-up training, including robot set-up on the Qiagen Universal BioRobot, followed the extraction and quantitation training. The analysts were taught to set-up the 96-well plates to be analyzed on the 3130 Genetic Analyzer using the Corbett CAS-1200/QIAgility liquid sample handler.

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The final DNA analyst training module included DNA typing using the 3130 Genetic Analyzer, data analysis, CODIS entry and report writing. Once the analysts became qualified to operate the four laboratory robots and the Genetic Analyzer, they were integrated into the property crime analysis schedule as "Team #2" and assumed most of the laboratory analytical tasks while the four fully trained DNA analysts ("Team #1") remained responsible for all of the DNA data analysis, interpretation, and report writing. Team #2's involvement in analyzing property crime cases fluctuated depending on the availability of training classes and the schedules of their training mentors. In September 2011 the new DNA analysts (Team #2) pulled back from casework and focused on completing their DNA typing, mixture interpretation, population statistics, and CODIS training modules. All of the new analysts completed their DNA typing training and associated modules by the end of March 2012.

3. Equipment Purchase and Validation

The new instrumentation required extensive validation before it could be implemented and used with casework. At the beginning of the grant period, the first team of analysts were not only processing property crime cases but had to plan and lay out a new robot extraction area, select a large scale robotic extraction system, assist with the robot validation, and create new methods and training procedures for the other staff. In addition to the laboratory analyses that were conducted as part of the validation process, analysts had to update the Quality System Manual and train fellow employees. Implementation of additional liquid handling and extraction robots, even the same models that were already validated for use in the laboratory, required performance checks that had to be completed, and manuals updated, before they could be used in casework.

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The addition of new equipment threatened to take analyst time away from casework in order to validate the new equipment and methods. To minimize that effect, funds from the 2008 DNA Backlog Reduction/Capacity Enhancement Program Grant were used to hire an outside resource to assist with the validation of a Tecan HID EVO 150 extraction robot with Prepfiler chemistry. 2009 DNA Unit Efficiency Improvement Grant funding was also used to provide overtime funds for analysts to validate the new Genetic Analyzer (3500), validate a new typing system (Identifiler Plus), investigate the feasibility of implementing Biomatrica DNA Stable into the High Volume DNA Analysis Line and evaluate a new push-off tip swab for DNA collection. Having grant funded overtime available ensured that analysts were able to complete casework assignments during normal work hours while being able to accomplish the projects described above.

There were two major delays that hindered the implementation of the grant. The first was hiring personnel for our second team of property crime analysts during a County hiring freeze and budget crisis. The second major delay was purchasing the robotics and other equipment needed to form the High Volume DNA Analysis Line in the laboratory. Early on in the project (March 2010) Orange County discovered that the laser swab cutter included in the grant proposal was no longer available for purchase. The company that managed the laser swab cutter, BSD, Inc. was taken over by a larger company that discontinued the swab cutter production. OCCL was faced with the need to find an alternative method of streamlining the swab excision process. This need led to an impromptu swab evaluation study that was conducted by an OCCL forensic scientist. Cotton and polyester tipped swabs were evaluated for ease of handling and recovery of DNA.

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A push-off Fitzco CEP™ swab that resembles a toothbrush, but has a cotton swatch rather than bristles, was selected and recommended for Orange County law enforcement agencies to use when sampling property crime evidence. These swabs were introduced during a First Responders training course that was offered to local law enforcement agencies in June 2011 and October 2011 and were included in the evidence collection kits provided to the attendees at the end of the training. However, to date, very few of the agencies have converted from regular cotton tip swabs to the new Fitzco CEP™ swabs primarily due to the cost. OCCL still excises hundreds of property crime evidence swabs by hand using scalpel blades.

As with most government agencies, there are multiple layers of purchasing requests and approvals that have to be navigated before capital expenditures (greater than $5,000) can be completed. Items to be purchased had to be budgeted and included in quarterly budget reports. Unbudgeted items and purchases over $100,000 required approval by the County Board of Supervisors before the issuance of a purchase order. At any time during this process, the County Auditor's Office and Risk Management could request additional information about a vendor and/or the services required.

Some of the equipment that was purchased for the project required sole source documents to be prepared and approved by NIJ before we could begin the County purchase process. Many of the more costly items to be purchased, such as the extraction and liquid handling robots, were budgeted but still needed approval from the Board of Supervisors. Items that could not be sole sourced went out to bid. Whether an item went out to bid or was sole sourced, the time for acquisition was still the same. Grant instrument and equipment purchases required the assistance of a dedicated budget analyst and multiple buyers.

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On average, it took approximately three months to the purchase each new piece of equipment. This period could be prolonged depending on whether Board action was required or negotiations were necessary between the County and the vendor to accept each other's terms and conditions. If the Board of Supervisors' approval was required, then additional time was spent scheduling the agenda item and making an appearance before the Board to justify the purchase. The Board approval process could add a couple of months on to the purchase time. Disagreements would frequently occur between the County and a vendor that resulted in extended negotiations. Many of the disagreements were typically due to indemnification agreements, record keeping periods or liability insurance requirements.

There were additional delays that involved the installation and implementation of newly purchased instrumentation. The first was caused by the remodel of a small evidence examination room to accommodate the Tecan HID EVO 150 extraction robot. New counters and cabinets plus electrical and computer network lines had to be installed before the Tecan robot could be set up in the examination room. This process took much longer than expected which postponed the validation process. The second delay was due to a large scale liquid handling robot inconsistently pipetting the small volumes required for quantitation and amplification procedures. The same model robot had already been validated and was being used in our laboratory and should have only required a straight forward performance check before it could be used in casework. The inconsistent pipetting issue resulted in replacement of most of the syringes and tubing, software modifications, field calls, and repeated quality control checks that took more than one year to complete before the robot was implemented in casework processing.

In addition to the equipment and robot systems listed above, grant funding provided reagents and supplies that were used to perform validations and train new analysts. Two DNA

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analysts were sent to Tecan, Inc. to attend programming classes so we could create and modify scripts in-house as needed. Two DNA analysts were also sent to a training class at the manufacturer's facility for the new 3500 Genetic Analyzer. The class helped the analysts to understand the internal components of the instrument and to troubleshoot problems. Grant funds were used to purchase the most current version of the software for DNA data analysis (GeneMapper IDX). Biomatrica dry storage liquid reagent was validated and is being used to store remaining DNA extracts in 96-well plates from property crime cases. OCCL plans to expand the use of Biomatrica dry storage to major crime extracts in the near future.

4. High Volume Crime Line Flow Evaluation

The staggered work schedule with the five day rotational block approach proposed in the initial grant solicitation was overly ambitious and underestimated the time that was necessary to process property crime cases in light of the following:

- The proposed schedule was created in 2009 prior to selecting an automated extraction platform.
- The schedule also counted on analysts using an automated swab cutter to excise evidence swabs. OCCL attempted to purchase the swab cutter but it was discontinued in June 2010 and was no longer available
- An additional concentration step was required at the end of the sample extraction procedure.

OCCL initially proposed that the sample digestion process for two batches of 76 samples each begin in the evening of Day One. At the time, the DNA Section was manually extracting

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property crime samples overnight and using phenol/chloroform clean-up on the second day of the extraction process. The extraction of property crime samples is now done using the Tecan HID EVO 150 robot with Prepfiler chemistry. During the development of the Tecan HID EVO 150 robot with Prepfiler chemistry extraction protocol, it was determined that an additional concentration step was necessary to maximize the total yield of DNA from evidence samples since many of the sample extracts only contained enough DNA for one amplification and was often consumed in analysis. The concentration step using a vacuum centrifuge takes 1½ hours to complete.

The entire robotic extraction process takes six and one half hours to complete and includes the additional one and one half hour step at the end to concentrate and reconstitute each sample to a uniform volume. Thus the extraction, concentration, and reconstitution steps cannot occur on the same day as sample screening and swab excision; especially since the automated swab cutter that was going to be used was no longer available. So, while the implementation of the Tecan/Prepfiler extraction system does save analyst hands-on time, the length of the extraction process has required that the entire extraction and concentration process be spread out over Days One and Two of the schedule.

There were other factors that impacted the lab's ability to maintain the fixed five day rotational block approach: First, there was, and still is, a large quantity of cases containing touched and handled items of evidence being submitted. Each case can include up to four victim elimination standards that need to be analyzed before the DNA data can be interpreted. The majority (>60%) of our County's burglary scene evidence consists of touched and handled items that often yield multiple mixture profiles resulting in extensive mixture interpretation and detailed report writing and review.

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Second, since many (>60%) of the evidence submissions were from victim owned items that had been touched or handled by the suspect, it was recognized that, in the long run, it would be more efficient and cost effective to wait and analyze the victim elimination samples after the DNA results from the evidence was evaluated. Even though victim elimination samples are tested only for cases where an interpretable DNA profile is obtained, there are still a sufficient number of them that need to be analyzed and worked into the high volume schedule.

Third, DNA analyst schedules are not entirely predictable and vary due to court appearances, training, rush cases, and submission of CODIS confirmation standards. The number of CODIS confirmation standards submitted to our laboratory has increased approximately 4-5 times in number since the beginning of this project. Each confirmation standard had to be analyzed in a ten day time period since they are often collected at arraignment and DNA typing results may be necessary for the preliminary hearing unless a defendant waives time. The DNA profile from each confirmation standard must be compared to the profile from evidence in one or more cases and an additional report prepared.

OCCL reached the inevitable conclusion that the fixed work schedule needed to be revised. A general schedule that could be customized by a DNA supervisor and spread out over a two week period was adopted instead. The new batching schedule described below, provides sufficient flexibility to account for analysts' varied schedules, the frequency of court testimony, training and casework backlogs:

Step 1: Evidence examination, presumptive testing, and excision of 1-3 swabs per case Monday through Friday of week one. This includes DNA number and batch assignment.

Step 2: Extraction, extract concentration, and quantitation of evidence samples on Monday of week two.

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Step 3: Amplification and 3130 Genetic Analyzer set up on Tuesday afternoon, week two.

Step 4: Quality control of the genetic analyzer run, data analysis, and mixture interpretation of evidence samples on Wednesday.

Step 5: Thursday and Friday, week two: sorting of cases based on typing results; identifying those cases where the victim submitted elimination standards needed to be analyzed for interpretation; report writing and review; (report writing and review can flow over to the following week (week 1 of the new two week scheduling period) and these tasks are completed along with the new round of sample examination and processing.)

Cases were sorted, during Step 5, into the following categories: (1) Cases with insufficient DNA for typing; (2) Single source/major contributor on evidence items left behind (includes blood, saliva, clothing, and handled items); (3) Single source/major contributor on victim owned items; and (4) Unresolved mixture profiles that are not suitable for comparison. Cases in categories 1, 2, and 4 were advanced to report writing. Cases with single source and major contributor DNA profiles on items left behind were given high priority since these profiles could be immediately uploaded into CODIS. Victim elimination swabs were sampled for the category 3 cases in order to determine if the crime scene profile obtained was probative. A chart demonstrating the workflow of property crime samples in the laboratory is provided in Attachment C.

The victim elimination standards were extracted, amplified and typed as part of the major crime processing line and results were typically obtained within one week. Although the hands-on analytical tasks in the laboratory, for a batch of 76 samples, could be easily completed in

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three days by one analyst, the completion of a full extraction batch, including the processing of necessary victim elimination standards, mixture interpretation, CODIS entry, and the preparation and review of the final report, could take up to 3-4 weeks.

C. Project Statistics: Tables, Charts, and Figures

The OCCL LIMS, the OCCL WRCS website, spreadsheets created by the Research Triangle Institute (RTI), a basic Excel spreadsheet and the OCDA CMS were used to collect and track project outcome metrics and measurements. Data not routinely entered into LIMS such as sample type, quantity of DNA recovered and the type of DNA result obtained (such as major contributor versus unresolved mixture) was captured on the Excel spreadsheet. The Excel spreadsheet also included a list of all cases where a suspect was identified from a questioned sample either through the submission of a standard or by a CODIS match.

Each of the charts presented in most of this section are divided into three segments by vertical lines. The first segment contains data from May – October 2009. This is pre-project data that was collected from the six month period before the 2009 DNA Efficiency Grant was awarded. This period includes the start of property crime case triage process by the OCCL and the OCDA (September 2009). The next phase, October, 2009 – April 2011, is the implementation of the project in the laboratory and covers the time that new instrumentation was purchased and validated, and additional DNA analysts and support staff were hired. Property crime work request triage was actively taking place during this period and the web based WRCS site was established. The third phase is post-implementation from April 2011 to March 2012. Post-implementation was defined as the period where the laboratory equipment and procedures were in place and finalized. Two teams of analysts were working solely on property crime cases

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in the laboratory, and property crime work requests were being routinely triaged. This post-implementation phase is not considered to be the final or full project implementation because the following events were occurring during this time period:

- The new DNA analysts were still completing their training and were not performing every step of the DNA analysis process independently;
- Approximately twenty batches of property crime swabs that had been excised by the new analysts and stored in the freezers at the beginning of their training were being extracted using the validated Tecan/Prepfiler robotic extraction system validated in December, 2010; and
- Refinements and improvements were being made to the property crime team work schedule, work request submission website, and the triage process to simplify and streamline.

1. Property Crime Case Submissions

The OCCL began analyzing a limited number of property crime samples in 2003. At that time, property crime cases were selected for DNA analysis based on the severity of the crime committed and the amount of damage or loss. In 2005, the lab began accepting more property crime cases and actively solicited these cases as a participant in the NIJ DNA Expansion Demonstration Project. Since 2005, the quantity of property crime cases submitted to the DNA Section for analysis has steadily increased. The numbers of burglary, larceny, and theft cases submitted to OCCL for DNA analysis are listed below:

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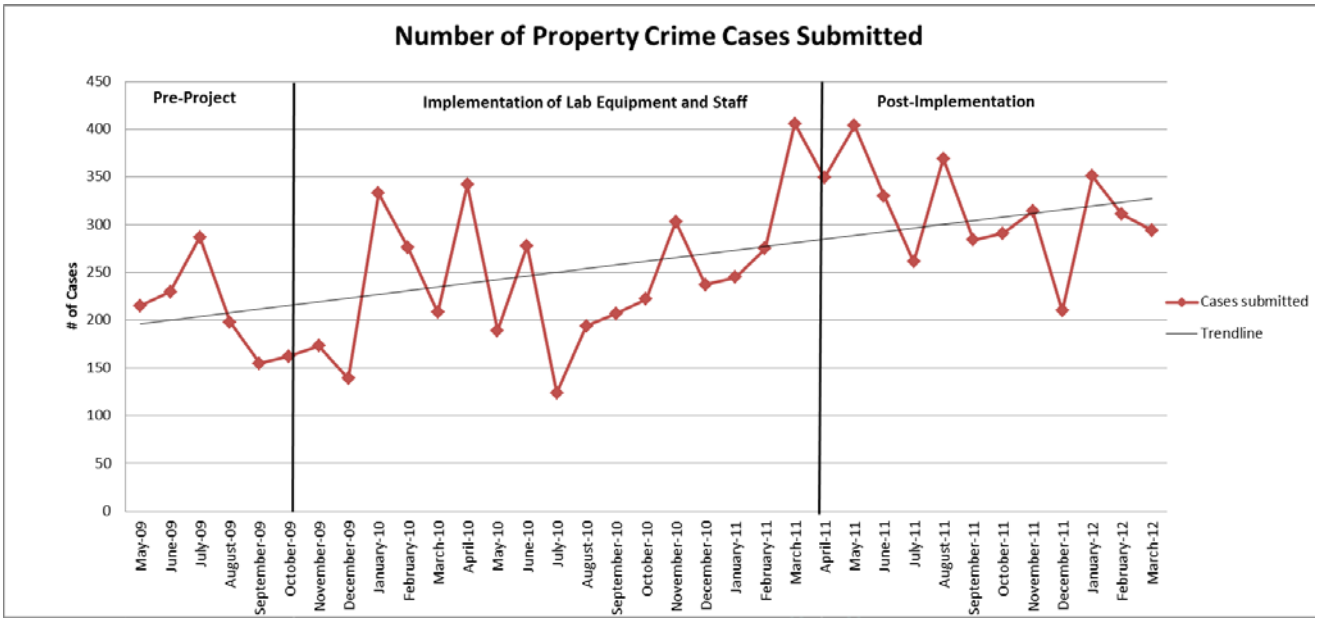
Burglary/larceny/theft cases submitted to the OCCL for DNA analysis

- 2007: 779
- 2008: 1,384
- 2009: 1,112
- 2010: 1,641
- 2011: 2,568

Property Crime Cases Submitted to the OCCL from May, 2009-March 2012

The number of property crime cases submitted to the DNA Section, even prior to this project, fluctuated erratically from month to month. The trend line in the chart below demonstrates an overall increase in the number of property crime DNA cases submissions since May 2009. The number of property case work request submissions appears to have leveled off to an average of 310 cases per month in the post-implementation segment of the chart.



2. Property Crime Cases and Samples Analyzed

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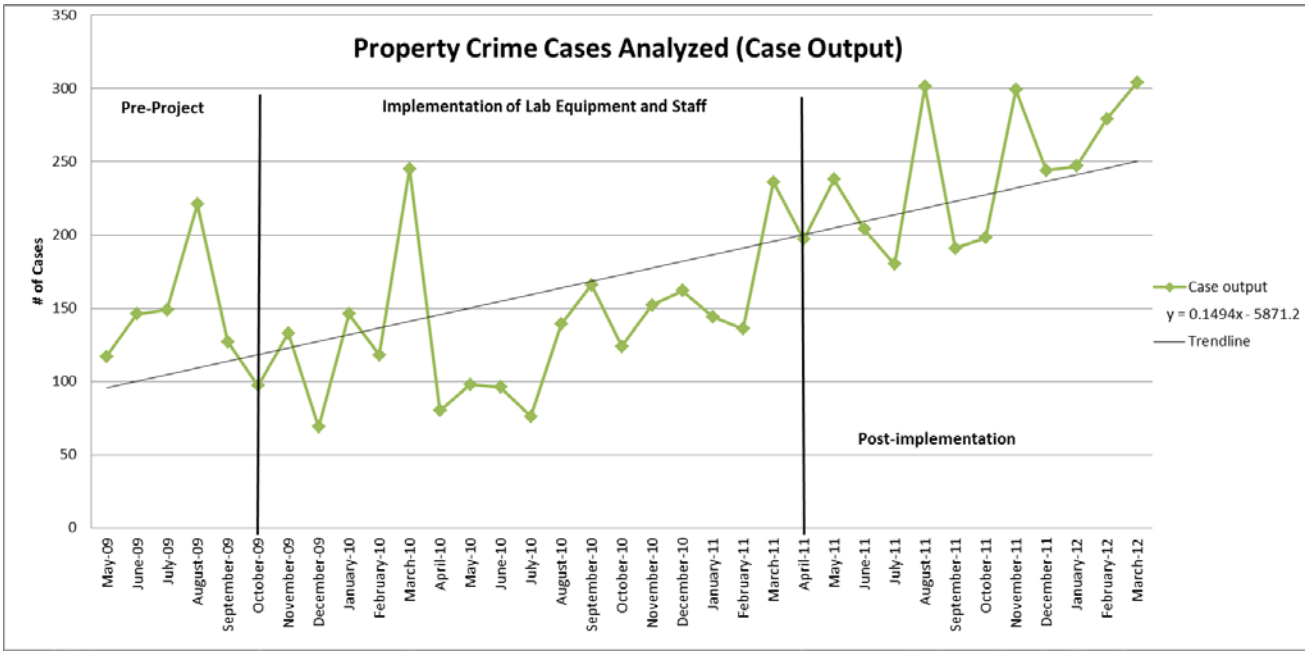
The data in the chart below illustrates that the number of property crime analyzed by the OCCL between May 2009 and December 2011 has been steadily increasing since July 2010. Prior to July 2010, the number of cases analyzed fluctuated between a high of 245 cases (March 2010) and a low of 69 (December 2009). Though there are still fluctuations in the number of cases analyzed each month, since implementation of the additional staff and robotics during this project, there is clearly a steady increase in laboratory capacity.

Property Crime Cases Analyzed between May 2009-March 2012



Some of the factors that affected the number of cases that were analyzed between May 2009 and March 2012 and caused many of the month to month fluctuations were:

- Some of the property crime cases analyzed during in the early months on this chart were processed on overtime using funds from the 2008 DNA Backlog

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Reduction/Capacity Enhancement Grant. Grant funds were used to analyze one thousand (1,000) backlogged property crimes between November 2008 and February 2010.

- Property crime work requests began to be triaged in September, 2009. Triaging resulted in higher quality DNA cases being submitted to the DNA analysts. Analysts were able to focus on the laboratory aspects of a case and did not have to call and e-mail investigators for necessary case and evidence information before they could enter profiles into CODIS. This resulted in analysts spending more time analyzing and reporting out results for cases after triaging began.
- Property crime samples were batched and manually extracted prior to December 2010. In January 2011, property crime samples continued to be batched but were extracted on the Tecan robot using Prepfiler chemistry. As additional robots such as liquid handling systems were added, validations were completed, and procedures were implemented, analysts were able to process more samples in the laboratory as the Property Crime Program progressed.
- The first team of dedicated property crime DNA analysts (Team #1) was formed in November 2009. This team researched and validated new instrumentation and equipment, designed the layout of a new robot extraction room, assisted with the new analysts training, created and updated procedures for the laboratory's Quality System Manual (QSM), analyzed incoming property crimes cases as well as tried to reduce the backlog. Team #1 handled many diverse and new assignments as well as took on most of the case work responsibility.

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- The original members of Team #1 were replaced at the end of 2011 and were assigned to major crime casework. Although the second group of Team #1 members was also comprised of experienced DNA analysts, they still had to familiarize themselves with the Property Crime Program procedures and new robots such as the Tecan/Prepfiler extraction system which resulted in a short term drop in the number of property crime cases analyzed between December 2011 and January 2012.
- During most of the grant period – implementation and post-implementation- the second team of analysts (Team #2) was in the process of training and only qualified to perform laboratory procedures (no data analysis or report writing) up to March 2012. Team #2's involvement in analyzing property crime cases fluctuated depending on their attendance at training classes and the schedules of their training mentors. In September, 2011 the new DNA analysts (Team #2) pulled back from casework and concentrated on completing their DNA typing, mixture interpretation, population statistics, and CODIS training modules. All of the "new" analysts completed their DNA typing training and associated modules by the end of March 2012.

Property Crime Samples Analyzed between May 2009-March 2012

The number of cases analyzed per analyst is difficult to calculate because the property crime case processing consists of team batching. Although the number of property crime samples analyzed also fluctuated erratically from month to month, the graph below demonstrates that the lab's capacity to process property crime samples has expanded and that an increasing number of samples are being analyzed using the Property Crime DNA analysis platform.

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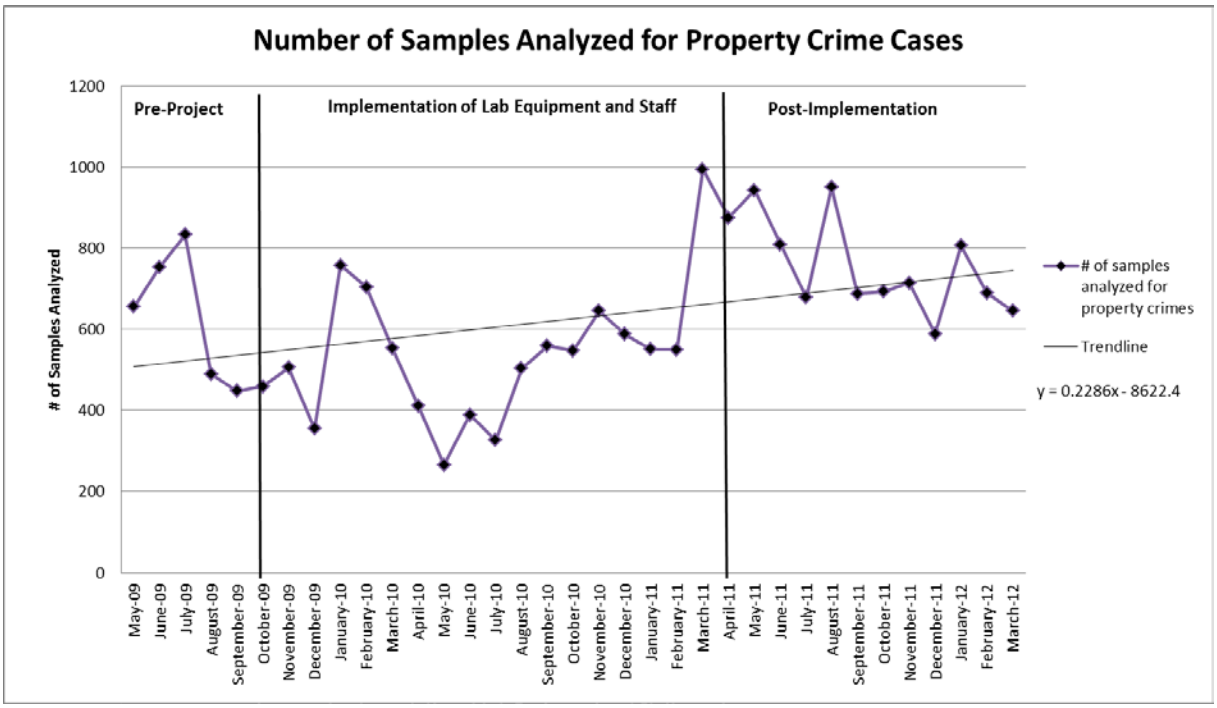

3. The Property Crime Backlog

The property crime backlog reached its lowest point (559 cases) in March 2011 and was at its highest point (4,016 cases) in May 2009. The decrease in the number of property crime cases observed before September, 2010 was influenced partly to the OCCL receiving 2,900 hours of overtime from the 2008 DNA Backlog Reduction/Capacity Enhancement Program Grant. The overtime was used between November 2008 and February 2010 to analyze one thousand (1,000) backlogged property crime cases. Personnel from the OCDA and one OCCL DNA Supervisor also reviewed approximately 1,860 DNA work requests during this period and returned 65% of them to the agencies to have relevant information added before the cases would be analyzed by the DNA staff. The majority of those work requests were not returned to the lab for analysis. The first team of DNA analysts consisting of one halftime and four fulltime analysts was also formed in November 2009. This team was dedicated to working only property crime

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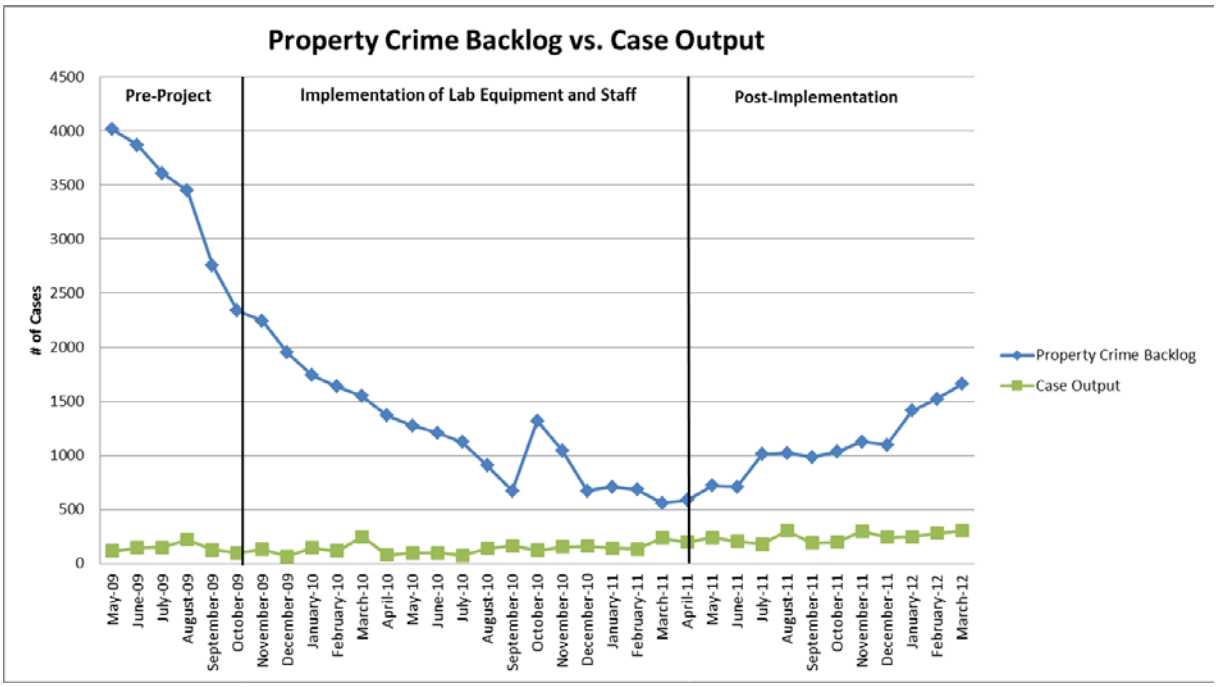
cases that, prior to this time, had only been assigned to analysts when they could be fitted into existing work schedules and laboratory batches.

OCCL's Property Crime Backlog vs. Case Output from May 2009 to March 2012



Since April 2011, the property crime backlog has been increasing. The overall increase in the submission of property crime cases is most likely due to the training that the OCCL and the OCDA provided to the Orange County police agency investigators and CSI Staff around this time. DNA Supervisors and a Deputy District Attorney from the OCDA DNA Unit went to the agencies and delivered updates regarding the Property Crime Project, answered questions about the new WRCS website and shared case statistics from the past year of DNA submissions that were specific to the agency. In addition, "First Responder" training targeted at police officers, new CSI personnel, and task force members who respond to property crimes began in June 2011. A second session of First Responder training took place in October 2011. This training was

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conducted by OCCL and the OCDA personnel at the laboratory and included lectures and hands-on evidence collection training. Another cause of the increased property crime submissions is the success of the program. Investigators, CSI staff, and law enforcement management have noticed the increase in the number of cases that have been solved with DNA and therefore are collecting and submitting more evidence from property and major crime cases for DNA analysis.

4. Turn-Around-Time (TAT)

Turn-around-times were prepared for two periods. The first period is between August and November 2010. This period is during the project implementation stage. Analyst trainees had been hired and new equipment was being purchased and validated. The DNA work request triage process had been in place for approximately one year but the WRCS website with the e-mail communication log was not being used consistently by all of the County agencies. The second period is between January and April 2012. Triaging, the WRCS website, and all instrumentation and procedures had been implemented. The new DNA trainees were just completing or completed their DNA typing training during this time and were working more independently. The turn-around-times were generated using WRCS, LIMS and an Excel tracking spreadsheet. Turn-around-times were generated for normal business days and do not include weekends.

Turn-around-time statistics have been captured in the following manner:

- Time for Triage Process refers to the period of time from when the work request was submitted, the case was accepted for testing and entered into LIMS.
- Evidence Requested refers to the period between when the case was accepted and when OCCL requested that the police agency deliver the evidence to the lab.

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- Evidence Delivery refers to the time it took for a police agency employee to deliver the requested evidence to the lab.
- Time to Assign Analyst refers to the period of time between the delivery of evidence to the lab and the assignment of an analyst to conduct DNA testing
- Time to Complete Lab Work and Issue Report refers to the period of time between the start of evidence examination and analysis and the preparation of a lab report.
- Total Time refers to the period of time between the police request for DNA analysis and the issuance of a final report.

Turn-Around-Times (TAT) for Property Crimes: August-November 2010

Pre Implementation: August 2010 - November 2010	Average Turn Around Time (in workdays)							
	Time for Triage Process	Evidence Requested	Evidence Delivered	Time to Assign Analyst	Time to Complete Lab Work & Prepare Report	Total Time (from Date Request Submitted to Final Report)	Range of Total Time	
							Min	Max
Blood – Residential Burglary	n/a	2	6	3	16	27	13	37
Blood – Vehicles & Commercial Burglary	n/a	14	5	5	17	41	11	295
Saliva – Residential Burglary	n/a	12	5	7	21	45	13	177
Saliva – Vehicles & Commercial Burglary	n/a	39	5	21	26	91	20	410
Left Behind – Residential Burglary	n/a	32	4	7	15	58	16	172
Left behind – Vehicles & Commercial Burglary	n/a	66	5	14	24	109	11	414
Victim Touch – Residential Burglary	n/a	70	5	6	18	99	13	711
Victim Touch – Vehicles & Commercial Burglary	n/a	102	5	10	23	140	15	741

The 551 cases processed for DNA during the four month interval between August 2010 and November 2010 were reviewed for TAT. The following types and number of cases were reviewed: blood from residential burglaries (8 cases), blood from commercial burglaries and

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vehicle crimes (29 cases) saliva from residential burglaries (13 cases), saliva from commercial burglaries and vehicle crimes (27 cases), residential burglaries with evidence left behind by a suspect (24 cases), residential burglaries with victim owned items handled by a suspect (142 cases), commercial burglaries and vehicle crimes with evidence left behind by a suspect (181 cases), and commercial burglaries and vehicle crimes where the suspect touches/handled various items (127 cases). There is a small number of blood and saliva cases for this period because these were high priority samples that were pulled immediately and worked as soon as they were submitted, even at the beginning of the project. All cases were processed during this time period using a manual organic extraction method. The Tecan/Prepfiler extraction system was being validated.

The OCCL DNA Section prioritized property crime cases by assigning the highest priority to residential burglaries and all property crime cases containing blood and saliva evidence including food and drink containers. Next in priority were items left behind at a crime scene by a suspect such as tools, hats, or clothing. The lowest priority designated was case evidence consisting of victim belongings that had been touched by the suspect or swabs from recovered stolen vehicles. Cases with victim items that were handled by a suspect typically take longer to process because victim elimination samples must also be analyzed to ensure that victim DNA profiles are not entered into CODIS. Because the majority of the touched evidence resulted in either insufficient DNA for analysis or uninterpretable DNA mixtures, victim elimination samples were not sampled until the DNA typing results from the evidence samples were completed and evaluated. These lowest priority cases comprise the largest portion of the OCCL property crime backlog.

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The majority (>90%) of the cases in the OCCL backlog have been, and still are, commercial burglaries, recovered stolen vehicles, and vehicular burglaries that have victim owned evidence items that were touched or handled by a suspect during the course of the crime. Since residential burglary cases and cases that have blood, saliva, and suspect items left behind at the crime scene as evidence are prioritized and moved to the front of the property crime analysis line they comprise only a small percentage of the backlogged cases. These cases have a turn-around-time that is at the lower end of the turn-around-time range which is approximately 45 workdays.

Prior to implementing this project, OCCL's average property crime TAT was approximately 125 workdays. Property crimes were worked into casework batches as space permitted and blood and saliva evidence were given priority. Before the laboratory began property crime case triage with the OCDA in September 2009, there was no mechanism in the laboratory for rejecting a case that was submitted for DNA analysis. When an agency submitted a case, it was prioritized based on evidence type and then added to the piles of property crime work requests waiting to be processed.

Since these cases had been submitted before the electronic work request system was in full use, the time it took to review and triage these cases was not consistently captured. The information in the chart above was collected using an Excel spreadsheet. The data in the chart shows how long it took the lab to request and receive the evidence, the time delay before evidence examination began, and the period of time between when an agency submitted a property crime work request to the time a final report was ready. In some cases the evidence was requested immediately (blood evidence), in other cases (vehicle crimes with touch DNA) the

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DNA Section Supervisor waited until the volume of evidence in the laboratory holding areas decreased before requesting delivery of new items.

Evidence delivery typically took 4-6 workdays. Once evidence was in the laboratory, regardless of the type of property crime case, it was typically assigned to a property crime DNA analyst in an average of 9 workdays, with a range from 3 to 21 workdays. The total time to complete the entire process, from request submission to final report, ranged from 27 to 140 workdays. The average time to process a property crime with blood evidence, the highest priority, in the laboratory during this period was approximately 20 workdays. The lowest priority evidence, vehicle crimes where the evidence consisted of swabs of the surfaces that a suspect touched, typically took more than 80 workdays to complete.

The longer laboratory analysis times were often the result of having to wait for all victim elimination standards to be submitted to the laboratory in order to complete a mixture interpretation or evidence comparison. The minimum and maximum times that it took to complete the DNA analysis on a property crime case – from receiving the work request to completion of a final report – varied significantly. The "minimum time" cases were primarily expedited for court or were part of a series and the cases were analyzed together. The "maximum time" cases are primarily outliers caused by misplacing work requests, laboratory staff waiting too long to receive information or evidence items from an agency prior to proceeding with an examination, and backlogged cases containing evidence unlikely to yield probative DNA profiles.

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Turn-Around-Time from January-April 2012

Post Implementation: Jan. 1, 2012 - April 30, 2012	Average Turn Around Time (in workdays)							
	Time for Triage Process	Evidence Requested	Evidence Delivery	Time to Assign Analyst	Time to Complete Lab Work & Issue Report	Total Time (from Date Submitted to Final Report)	Range of total time	
							min	max
Blood – Residential Burglary	8	5	4	15	28	58	27	112
Blood – Vehicles & Commercial Burglary	8	23	3	15	28	56	19	128
Saliva – Residential Burglary	21	2	4	12	25	61	28	132
Saliva – Vehicles & Commercial Burglary	12	34	4	15	26	87	29	273
Left Behind – Residential Burglary	23	23	5	17	21	84	25	476
Left Behind – Vehicles & Commercial Burglary	21	51	4	15	21	107	10	547
Touch – Residential Burglary	42	42	4	15	26	125	21	541
Touch – Vehicles & Commercial Burglary	42	79	4	15	25	162	26	475

Data to demonstrate the post implementation turn-around-time was collected for a set of cases that were processed during the four months of January 2012 through April 2012. Seven hundred and eighty three (783) cases were completed during this time frame. The two steps that had the greatest effect on turn-around-times were the triage process and the amount of time it took for the laboratory to request the evidence. Evidence delivery was the same as the previous period. The time it took to assign a case to an analyst increased from five to fifteen days average and the laboratory processing time increased from an average of 20 workdays to 25 workdays during this period compared to the August-November 2010 period.

The time to complete the lab work and issue a report was the lowest for blood and saliva cases due to these being single source profiles that could be immediately uploaded into CODIS. The touched and handled item cases tended to be mixtures that required additional time for the analysis and comparison of victim elimination standards, and thus increased total analysis time. The average time to triage a property case varied since cases with victim owned touch evidence

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took 2 to 5 times as long as the other evidence categories. The time it took to triage cases with touch and handled evidence was greater than the other types of evidence (blood, saliva, items left behind), mainly because the agency had to return to the field to collect and submit all of the necessary victim elimination standards in a case. A work request would remain in WRCS and the triage process would stop while the necessary standards were being collected. However, OCCL did not "stop the clock" while waiting for the standards and the additional time to collect the standards is relayed in the TATs calculated for touch type evidence during this period.

During this time frame, the triage process had been in place for over a year and the on-line Work Request and Case Status (WRCS) website had been operational for approximately six months. Both processes had been streamlined, improved and used extensively during this period. This resulted in many of the DNA work requests being promoted (accepted by the laboratory) and evidence being requested from the agencies quicker than in the past. Another factor delaying DNA analysts was latent fingerprint processing of these items which, at times, could delay DNA testing for 20 to 40 workdays.

On average, cases were assigned to analysts in fifteen workdays or less after the evidence arrived in the laboratory. For most property crime cases, it took less than a 20 workdays for the evidence to be processed in the laboratory. However, depending on the type of evidence, the need for victim eliminations to be analyzed, and if mixture interpretation was required, the final DNA report could be issued up to 100 workdays (average) after the case was triaged.

5. Quality of DNA Obtained from Property Crime Samples

From April 2011 through March 2012, the OCCL analyzed 4,554 property crime samples (2,214 cases) for DNA. Forty seven percent (2,153 samples) of the samples had no or insufficient

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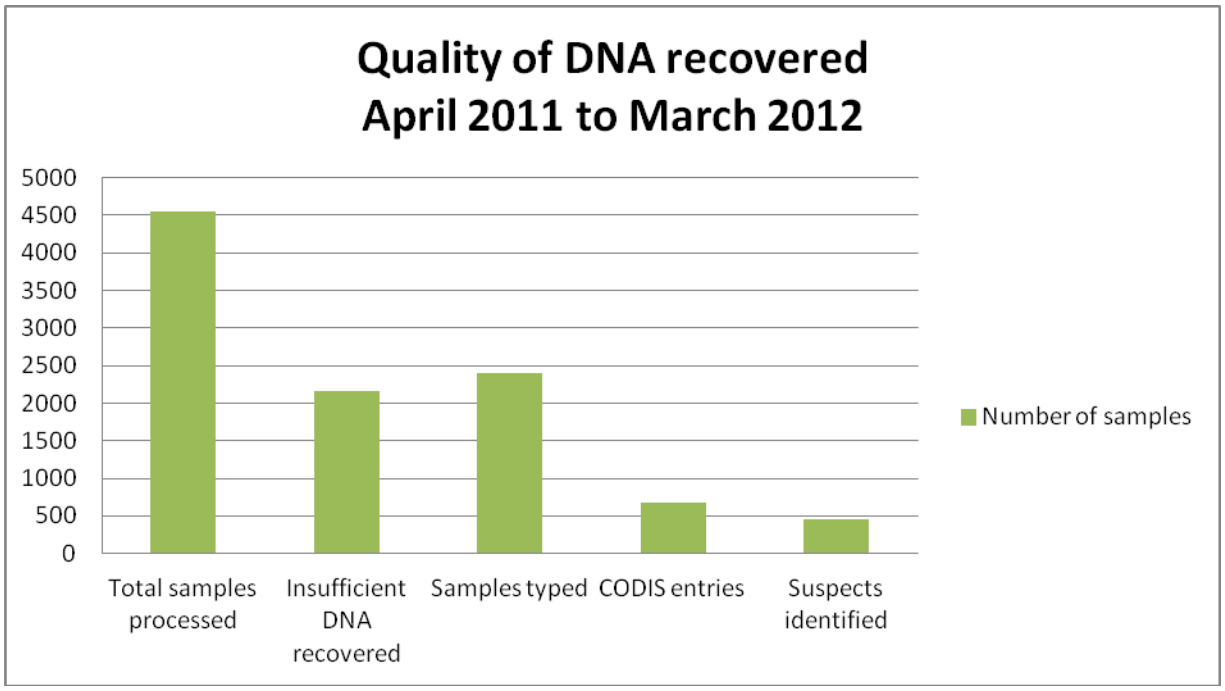
DNA present for amplification and typing. The OCCL uses an *Alu* based qPCR system for the quantitation of casework extracts with a sensitivity of 8 pg/ul. If the result is less than 100pg total DNA in the extract, then the sample is deemed as containing insufficient DNA for typing. Fifty three percent (2,401) of the samples had sufficient quantities of DNA for typing.



Of the 2,401 samples that had sufficient quantities of DNA for typing, single source or easily deduced major contributor DNA profiles were obtained 56% of the time. Two person mixtures were obtained 9% of the time. Victim elimination standards were typically required to interpret these two person mixtures to obtain a suspect profile for CODIS. Thirty-five percent of the time, the DNA typing results yielded mixture profiles that could not be resolved, and according to OCCL's criteria, were unsuitable for comparison.

Sixty four percent (1,529 samples) of the extracts typed contained a total DNA content of less than one nanogram. Most of the unresolved mixtures were from these low level extracts.

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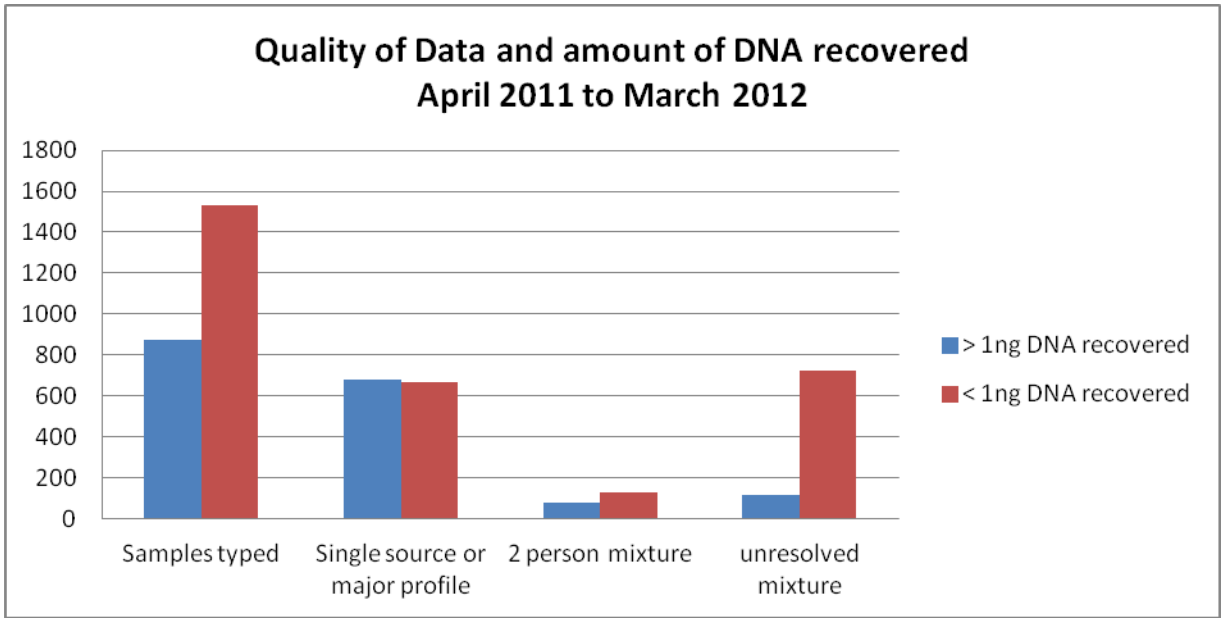
DNA profiles for CODIS entry were generated from 28% of the samples that had sufficient DNA for typing. Suspects were identified by CODIS hits at the state or local level for 68% of the CODIS entries.



6. CODIS Entries from Property and Major Crime Cases

The chart below shows that there were great fluctuations in the number of CODIS entries each month for both major and property crimes. The number of CODIS entries for property crime cases (blue line) increased overall since April 2011 (post implementation of the project) with the exception of the month of December 2011. An average of 48 DNA profiles per month was entered into CODIS from property crime cases. The variation in the number of entries from month to month are due to reasons previously stated in the report which includes the implementation of new projects and processes in the laboratory, analyst training, court testimony, holidays, vacations, and time away attending professional seminars and training classes.

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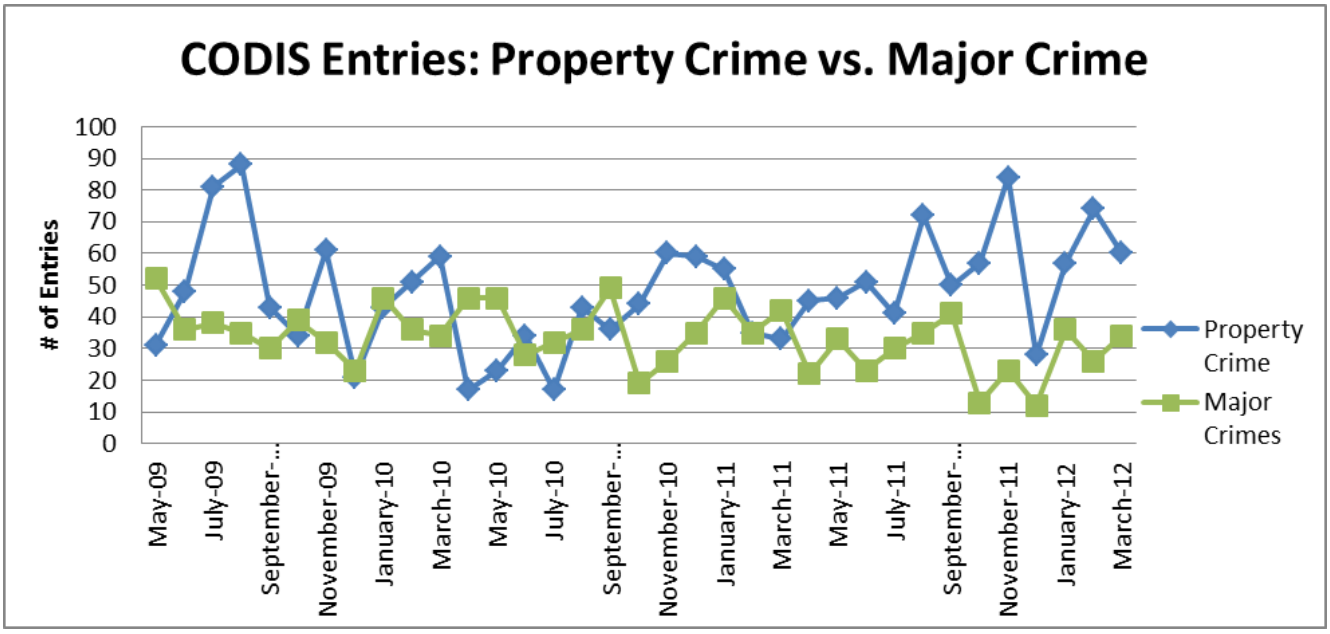
The number of major crime DNA profiles (green line) entered into CODIS also varied each month but showed in general a slight overall decrease since December, 2010. An average of 33 DNA profiles per month from major crime cases was entered into CODIS. The decrease in the number of major crime DNA profiles entered into CODIS was most likely due to the transfer of four experienced DNA analysts from major crimes to the property crime project, promotions of three major crime analysts to supervisors (two remained in the DNA Section, one transferred to another lab section) as well as an overall decrease in major crime occurring in the County.



7. CODIS Hits and Suspect Identifications

Four hundred and sixty two suspect identifications were obtained from the DNA analyses of 2,214 property crime cases analyzed between April 2011 and March 2012. The hit/identification rate for these cases was 20% or one suspect identification from every five cases. Approximately 61% of the evidence submitted in those cases was victim owned items that had been touched or handled by the suspect. Twenty seven percent of the cases contained

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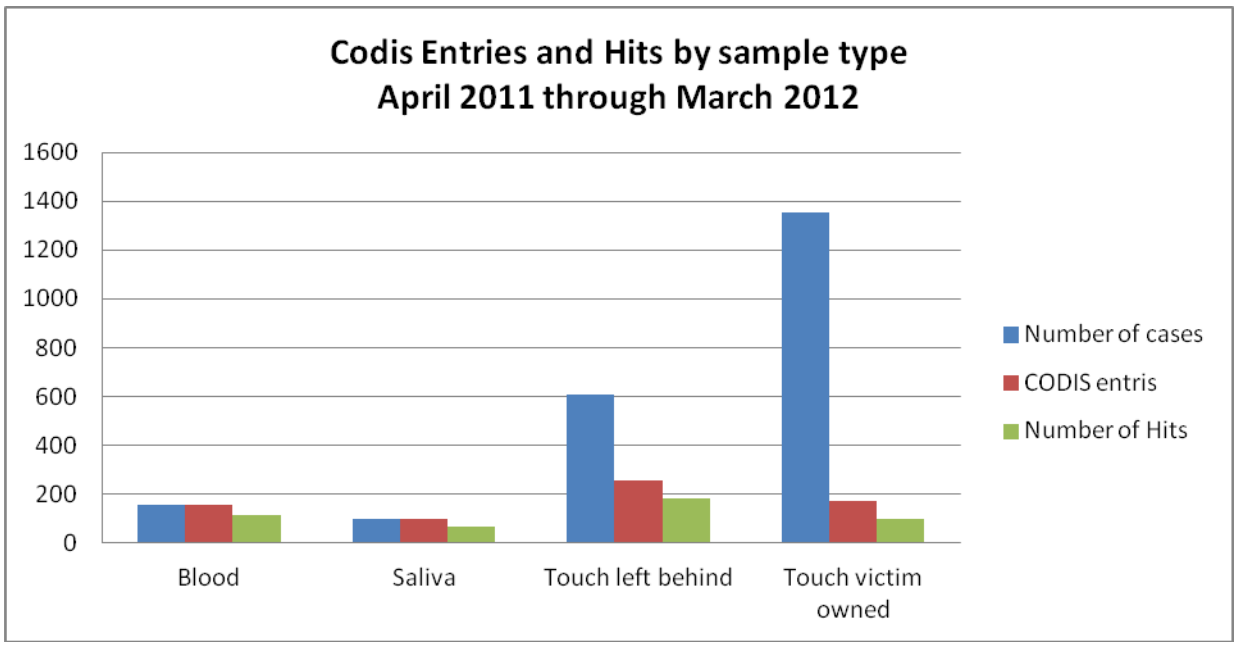
evidence items which consisted of clothing, tools, and containers left behind at the scene by the suspect. Approximately 5% of the cases had saliva and 7% of the cases had evidence items which consisted of blood.



Though over half of the evidence items consisted of victim owned items that had been touched or handled by the suspect, this type of evidence accounted for only 21% percent of the total suspect identifications. Blood had a 25% of the identifications, saliva were 15% of the identifications, and items left behind by a suspect accounted for 39% of the identifications.

The victim owned items that were touched or handled by a suspect were examined to determine how often a profile was entered into CODIS. Forty three percent of these cases produced a DNA profile that could be compared to the victim elimination samples to determine if the DNA was from the victim/owner or was deposited by the suspect in the course of the crime. Of these cases, 30 % resulted in a profile being uploaded into CODIS. 57 % of these CODIS entries resulted in a suspect identification. So, although CODIS profiles were obtained

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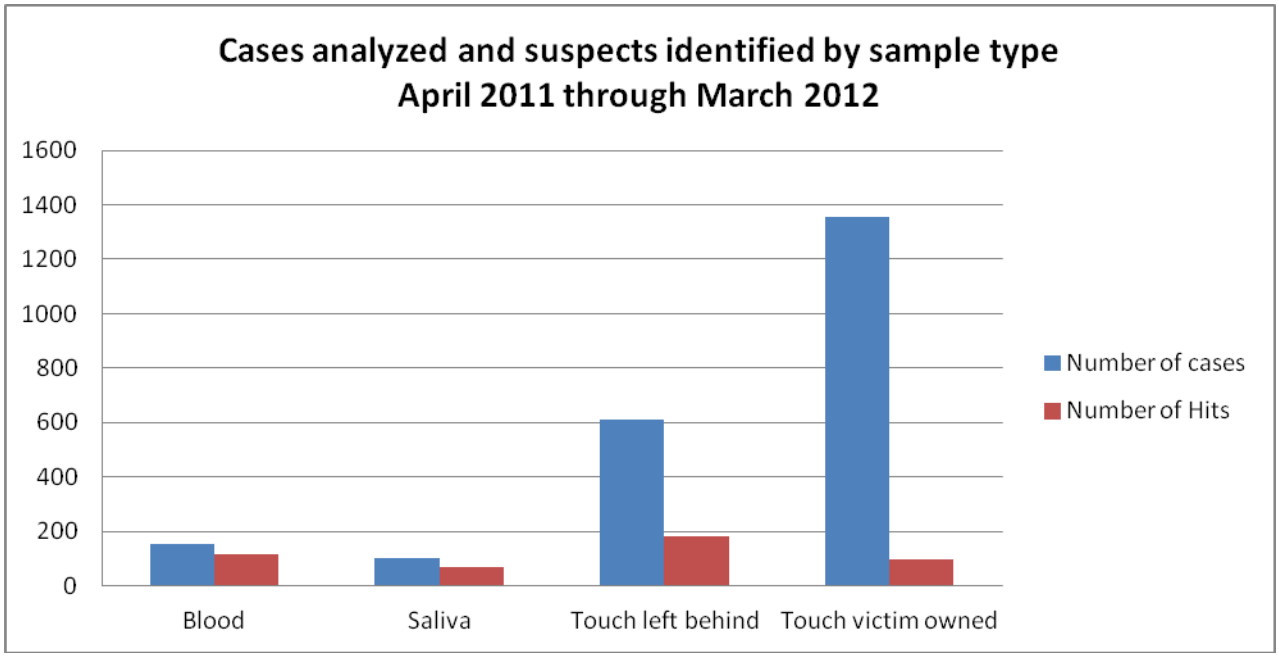
in only 13% of the total "victim owned/suspect handled" cases, once a DNA profile from this type of evidence made it into the CODIS database, the percentage of hits relative to the number of profiles entered was very similar to the number of CODIS hits obtained for cases with blood evidence (see chart below).



8. OCDA Filing and Prosecution Statistics

During the period from April 2011 to March 2012, the OCDA reviewed 462 Property Crime Program cases to determine whether criminal charges could be filed against a suspect identified through a DNA database hit. Criminal charges were filed against 339 defendants. 24 defendants were charged in more than one crime. Of the 462 cases that were reviewed, 312 were filed, 58 are under investigation, and 80 were rejected. Many of the 80 cases were rejected based on further investigation conducted by police agency investigators post-triage acceptance of the case for DNA analysis. For example, in some situations, an identified suspect was able to provide a legitimate reason why his or her DNA was present on an object left behind at a crime

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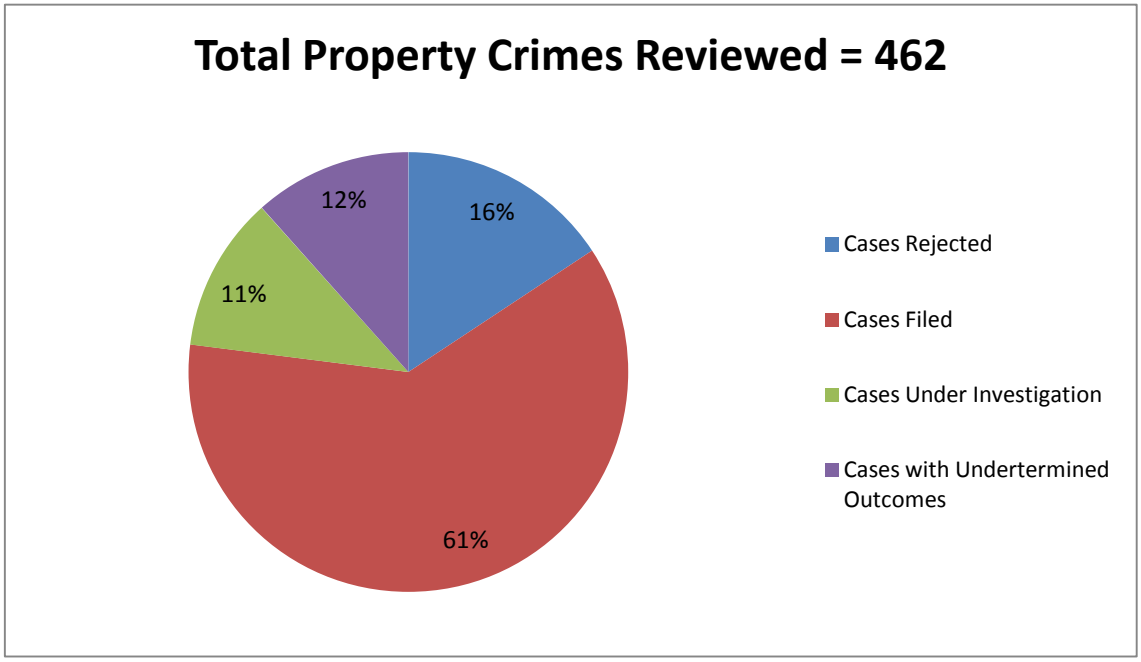
scene (a man whose stolen hat was found at a burglary scene). In other cases, additional investigation lessened the probative nature of the evidence collected (information developed that supported a suspect's contention that he purchased a car from the victim and that the victim reported the car stolen when the suspect was unable to continue making payments). Refused cases also included those that were not filed "in the interest of justice" when the identified suspect was already serving or had recently been sentenced to serve a substantial prison term (since additional criminal charges would not materially affect the length of that sentence and would instead consume valuable criminal justice resources).

The OCDA Case Management System cannot accurately account for the total suspects identified since many defendants already had cases pending and the DNA charges were added to the existing case. As a result, outcomes from only 450 of the 462 program cases could be determined. The results are illustrated in the chart below.



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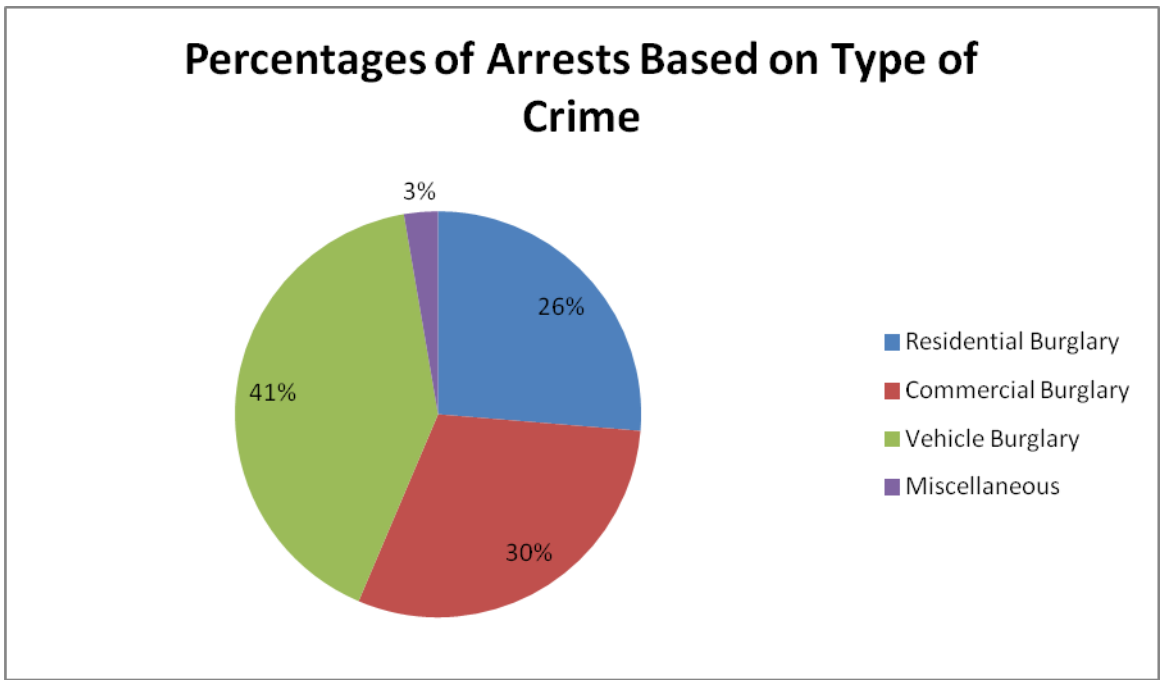
One hundred and sixty-one, or 50% of the 462 cases have completed the adjudication process. Of these cases, 42.2% of the defendants received state prison sentences and 57.8% of the defendants received local jail sentences or sentences that did not include jail time. Of the remaining cases that have been filed but not fully adjudicated, 27.7% are in warrant status and 22.3% are active, pending trial.

Criminal charges were filed against 336 defendants. Twenty-four defendants were charged with more than one crime. Using arrest statistics and information to review the 462 Property Crime Program cases reviewed, 26.3% of the crimes charged were residential burglaries; 40.9% were vehicle burglaries; 30.1% were commercial burglaries; and 2.7% were miscellaneous theft related crimes, as seen in the chart below.



It is impossible to determine the increase in property crime prosecutions that were initiated solely as a result of the Triage System. OCDA files thousands of property crime cases each year. A majority of the cases filed were non-DNA (no DNA was collected at the crime

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scene), or DNA collected in the field but not submitted to the lab. The collection and/or analysis of DNA in a property crime case can affect the outcome of a case in a number of ways:

- DNA collected may give notice to a defendant that analysis may occur and results may be obtained. Knowing this fact may encourage a defendant to plead guilty early in the criminal proceeding, before DNA analysis has begun. In these situations of early adjudication, the triage system would be able to prevent unnecessary DNA analysis.
- A case may be filed based on non-DNA evidence but as the case approaches trial, DNA analysis may become necessary to support prosecution. Triage System deputy district attorneys and paralegals would be able to advance a case for analysis in the situation where such DNA results might be needed.
- Or, a case may simply not be filed when the elements of a crime are not met or a case is refused by OCDA in the "interests of justice." Again, the Triage System deputy district attorney and paralegal can make this determination before unnecessary DNA analysis is commenced.

Although the number of cases advanced for prosecution cannot be empirically accessed in terms of increases and decreases, the Triage System is best viewed as increasing DNA efficiency because it significantly decreases the workload of OCCL forensic scientists and yields a higher percentage of good quality probative DNA samples.

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III. Conclusions

A. Summary of Project

Throughout the duration of the Property Crime DNA Program, valuable knowledge and experience was gained by Orange County police agency personnel, lab analysts and prosecutors. The first portion of this summary shall answer the question: "What worked well?" The key concepts and procedures that were created and adopted by project participants shall be discussed. The second portion of this summary shall focus on the problems that arose during the duration of the Property Crime DNA Program and the solutions that Orange County implemented to avoid and/or minimize these issues in latter project stages. This section of the conclusion will answer the question: "What needed to be done differently?" Finally, sharing of information; future considerations; and implications for policy and practice shall be discussed at the end of this summary.

1. Key Strategies that Yielded Positive Outcomes: "What Worked Well?

Open Communication and Cooperation Between Police Agency Personnel, Lab Analysts and Prosecutors

The elevated level of open communication and cooperation between the County's law enforcement entities and the implementation of the Triage System unequivocally yielded positive results. Communication in the form of training and feedback to police agency personnel increased the quality and number of property crime DNA analysis requests submitted to the lab. OCCL analysts and OCDA deputy district attorneys communication increased by providing training to the agencies, at the beginning of the project, that included feedback statistics related

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to each agency's DNA case submissions. Training sessions and meetings with the local law enforcement agencies encouraged the submission of property crime cases to the laboratory and resulted in increased submissions.

Overall communication was vastly improved between the forensic scientists, deputy district attorneys and police investigators with the creation of the Triage System and the WRCS website. Through the WRCS, agencies were able to submit analysis requests that lab analysts and prosecutors could easily evaluate. Indeed, excellent communication, particularly between forensic scientists and prosecutors was critical to the success of the Triage System.

DNA supervisors and deputy district attorneys have learned more about the criteria that each uses to accept or reject a case for DNA analysis and case filing. DNA Supervisors have gained a better understanding of why certain items of evidence may or may not support a case in court and deputy district attorneys obtained more knowledge regarding analyst determinations that a DNA profile can or cannot be entered into CODIS. Because of the open communication that was provided through the Triage System, police agency investigators learned what is required to have their cases successfully analyzed by the laboratory and filed by the OCDA. As triaging has continued, the quality of the work request submissions have definitely increased, the amount of time needed to triage the majority of the cases has decreased and the evidence being analyzed in the laboratory has resulted in more probative DNA profiles and CODIS entries.

The increase in CODIS confirmation standards being submitted to the lab is a result of not only an increasing number of property crime CODIS hits but also from the follow-up that is being done on CODIS hits by the OCDA DNA Unit. OCDA investigators follow-up on DNA hits from each police agency to ensure that the confirmation standards are collected and submitted to the lab in a timely manner so the laboratory does not have to assign "rush" status to

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these samples. This is another example, like the training of law enforcement agencies and triaging of work requests, of the cooperative agreement between the OCCL, the OCDA's Office, and the police agencies.

Implementation of the Triage System

Triaging has enabled the lab analysts to focus on laboratory casework, report preparation, CODIS entry, and court testimony. Analysts knew that the DNA profiles generated from triaged cases are more likely to produce meaningful DNA profiles capable of solving a crime or providing an investigative lead, and that the cases would be prosecuted if a suspect is identified. This knowledge of improved staff morale is illustrated by the trend of positive comments made by OCCL DNA staff to the auditors during the laboratory's annual QA audit in December 2011. Comments to the auditors included:

- There is acceptance of the high volume process and procedures and its success;
- There is a greater willingness of other analysts to answer questions and help each other;
- Analysts like the new mixture interpretation training and procedures;
- Having two teams (High Volume and Major Crime) that focus/specialize on certain types of cases is more efficient; and
- The analysts feel that the batching system has made the DNA Section very efficient.

The Triage System was devised to expedite evaluations of property crime DNA lab requests and curb unnecessary waste of the County's limited DNA resources. The Triage System eliminated non-prosecutable cases from the lab's work queue and redirected cases needing further investigation, necessary elimination standards or more detailed case information back to

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police agencies. Without doubt, the Triage System was a significant factor in the reduction of laboratory case backlog and unnecessary sample analysis. The data provided in "Section C: Project Statistics" illustrates that a significant number of cases were removed from OCCL backlog and property crime DNA work requests.

2. Problems Encountered and Solutions Implemented: "What Needed to be Done Differently?"

Inability to Demonstrate Effectiveness Within the Time Constraints of the Program

The problems encountered with hiring and training analysts, purchasing equipment, and validating instrumentation (chronicled in Project Design and Methods, Section1B: Property Crime High Volume DNA Platform) prevented Orange County from being able to fully demonstrate program effectiveness with the time constraints of the project. To fully demonstrate the total effect of the property crime teams, along with the triage process and new instrumentation on turn-around-time, Orange Country will need to collect data for a longer period of time, extending beyond the due date of this report.

The County believes that the property crime team concept is a good one, even though the ability to demonstrate its effectiveness within the time constraints of this project could not be accomplished. Delays with implementing the project, (hiring and training new staff, and purchasing and validating new equipment), and issues with analysts' schedules that were not fully anticipated (training seminars, court, employee time off), prevented OCCL from implementing the staggered team approach described in the grant proposal.

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Instead, a team that consisted of eight analysts who were dedicated to analyzing property crimes was adopted to address the high likelihood that analysts would be absent from the line because of illness, vacations, extended leaves, training, proficiency testing or court appearance. The team tracked each property crime evidence sample as it progressed through the system. Since each property crime team member was eventually trained in all aspects of forensic DNA analysis, (including evidence examination, robotic operation, DNA data interpretation and final report preparation), and all program tasks were shared duties among the team members, the team was able to easily adapt and perform the tasks of an absent team member.

This eight analyst property crime team utilized a flexible work schedule that could be customized based on the number of analysts in the laboratory, their schedules and their capabilities. OCCL now realizes that adopting the staggered team approach would necessitate teams comprised of five analysts per team or the addition of floating team members who could fill in and perform batching duties when analysts are away and write lab reports when that part of the process becomes bottlenecked.

Despite the inability to fully evaluate the effectiveness of the Property Crime DNA Program, some positive trends were observed. Although the in-lab processing times did not vary significantly between the implementation (20 workdays average) and post-implementation (25 workdays average) periods, the increase in laboratory time is believed to be the result of an increasing volume of work requests being received, pulling backlogged cases to work in with new high priority cases, and interruption of casework bathes and schedules to process rush cases and CODIS confirmation standards. Moreover, due to the addition of automation, the property crime case output increased from 551 (August-November 2010) to 783 (January-April 2012) cases during the four month periods that were evaluated. This was a 42% increase in case output.

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The turn-around-times from month to month varied largely depending on the projects and processes being implemented in the laboratory, (such as instrument validations, analyst training, holidays and vacations, and time off due to professional seminars and training classes). The turn-around-time also varied according to the type of evidence (blood, saliva, suspect owned item left behind, or victim owned item handled or touched by the suspect) being received, assigned and processed. A second team of high volume team analysts completed their training at the end of March 2012. Since then, this team has been steadily increasing their abilities to independently analyze batches of samples, review and interpret data, and prepare increasingly complex reports. However, the time constraints of this report do not allow for a full demonstration of the influence of the Property Crime Program of the turn-around-time of property crimes.

Additionally, during the course of this project the OCCL DNA Section created and implemented new mixture interpretation guidelines in April 2011. This change was in response to the SWGDAM mixture interpretation guideline proposal distributed in April 2010. The OCCL mixture interpretation guidelines, which took over a year to develop and implement, greatly helped the DNA analysts to consistently interpret DNA mixtures. The guidelines have also accelerated the mixture interpretation process by removing much of the subjectivity and providing the analysts with detailed instructions and references to use when evaluating and interpreting mixtures to obtain profiles for CODIS entry and comparison to reference standards.

Now that all of the OCCL crime analysts are fully trained, all equipment and procedures are in place and the triage and WRCS systems are fully functional, additional data needs to be collected from this point on to fully demonstrate how all aspects of the Property Crime Program work together to increase OCCL's capacity and reduce case turn-around-time for high volume crime.

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3. Sharing of Information

Orange County has been sharing the progress of the DNA Property Crime Program at professional meetings. An overview of the OCCL DNA High Volume Analysis Line was presented at the Bode West Technical Workshop (April 2011) and at the DNA Workshop at the California Association of Criminalists (CAC) Spring Seminar (May 2011). In addition, analysts gave presentations on the Tecan/Prepfiler validation at the CAC Fall Seminar (October, 2010) and on the Biomatrica dry storage of property crime extracts at an American Academy of Forensic Sciences (AAFS) workshop in February 2011.

The OCCL had an open house that featured the DNA High Volume Analysis Line in April, 2011. Chiefs and senior officers from local law enforcement agencies, members and advisors to the Orange County Board of Supervisors, staff from the CEO's office, command staff from the Sheriff's Department and members of the District Attorney's Office attended a tour of the DNA laboratory to learn about the new robotics and instruments that were purchased with grant funds and used to analyze biological evidence in the laboratory.

DNA staff participated in First Responder DNA Collection Training along with members of the OCDA's DNA Unit. The training was offered on June 7, 2011, June 9, 2011, and June 15, 2011 (two sessions). Additional First Responder Training was offered in October 2011. The training was Police Officer Standardized Training (POST) certified. The four hour training sessions consisted of two hours of lecture, one hour of hands-on evidence swabbing and DNA evidence collection, and one hour of actual property crime case review. One hundred and one patrol officers, detectives, and CSI personnel from sixteen Orange County law enforcement agencies and the Orange County Auto Theft Team (OCATT) attended the training.

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The new DNA collection swabs (Fitzco CEP swabs) were debuted and attendees were shown how to use the swabs to sample representative items of evidence. There were five hands-on sampling stations where attendees could practice collecting DNA from evidence and then correctly package the evidence swabs for laboratory submission. At the end of each training class, attendees from each agency were provided with DNA collection kits that were assembled by OCDA and Crime Lab personnel. Each kit was numbered and will be tracked by the DNA analysts as they are submitted to the laboratory so that the success of the training can be evaluated. Feedback will be provided to the agencies that will include the number of kits used by an agency, a breakdown of the types of evidence samples that were collected, the number of evidence swabs that yielded DNA, the number of evidence swabs that yielded CODIS profiles and the number of DNA hits obtained.

4. Future Considerations

The OCCL and OCDA provided training to Orange County police agency investigators and CSI staff encouraging the submission of property crime cases to the laboratory. Law enforcement heard the message and responded enthusiastically by submitting more and more property crime evidence to the laboratory to analyze for DNA. Carefully triaged cases have yielded increasing numbers of DNA hits leading to the successful prosecution of those responsible for the commission of these crimes. The increase in the number of criminal cases solved with DNA technology has in turn further encouraged CSI personnel to collect and submit property crime biological evidence for DNA analysis.

Orange County will need to meet the challenge of sustaining the progress that has been made thus far to increase the efficiency and capacity of the lab to analyze property crime

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biological evidence. Cost effective alternatives are being considered to address the costs associated with triaging and the high volume crime line.

The OCCL is continuing to consider the use of DNA technicians to perform more of the laboratory analyses and operate the robotics of property crime analysis line. The advantages of such a plan are obvious since technicians could be easily and quickly trained to assist with casework. Using technicians would incur lower personal costs and would allow DNA analysts to focus on the most time consuming aspects of the DNA analysis process; namely, data interpretation and report writing. However, a proper balance will be needed to ensure that analysts remain proficient in all laboratory procedures and avoid the burnout that is often associated with the repetitive performance of mentally demanding tasks such as data review and report preparation.

Also of concern is the need for Orange County, during an economic downturn, to provide funding for personnel, supplies and instrumentation maintenance at the conclusion of the grant period. Unless such funds are readily available, OCCL will need to maintain proficiency in both manual and robotic extractions, quantitation set-up and amplification set-up procedures in the event that robotic instrumentation failures occur that cannot be immediately repaired. Even more resources will be needed if a third team of DNA analysts is required to keep up with the volume of property crime cases being submitted to the laboratory for DNA analysis.

Of course, increased capacity to process property crime biological evidence and obtain DNA hits will not solve crime unless law enforcement agencies have the resources necessary to conduct follow-up investigations, obtain reference samples and present cases to prosecutors to review for possible criminal filings. A system must exist to ensure that follow-up investigation is conducted on all DNA database hits. The OCDA, throughout the grant period, worked closely

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with the police agency investigators to provide assistance and ensure that follow-up investigation was conducted on all property crime DNA hits. OCDA investigators assumed the responsibility of collecting reference standards from charged criminal defendants to alleviate the burden on police agency investigators and allow the OCCL to swiftly perform analysis of confirmation swabs in time for court proceedings.

For example, WRCS helped to speed up the process of obtaining information from the investigators and get the information entered into LIMS. However, there was, and still is, a learning curve with respect to managing the large amount of work requests received and fine tuning and streamlining the evaluation and acceptance process.

Also, a high percentage of the property crime cases resulted in no DNA evidence that could potentially be linked to a suspect. Continuing to streamline all processes, including laboratory analysis, mixture interpretation, and report writing will allow cases to be quickly evaluated so that more time can be spent on the cases with probative evidence.

Finally, data collected from the property crime cases that was analyzed under this project is currently being evaluated by OCCL and OCDA staff. This data will ultimately assist with creating polices regarding case acceptance and will give direction to the agency personnel who are collecting evidence. For example, a sample set of 404 vehicle burglary cases examined as part of this project was evaluated to determine how often DNA profiles and CODIS hits were obtained. Fifty (12%) of these cases involved blood evidence, and from them forty-eight DNA profiles were uploaded into CODIS. From these, suspects were identified in thirty-two cases (67%).

In comparison, 222 cases (55%) involved victim owned items that were touched or handled by the suspect in the course of the crime. From these cases, there were forty CODIS

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entries (18%) and only twenty of the profiles (50% of CODIS entries and 9% of the total cases) resulted in CODIS hits. Because of the extra effort needed to obtain probative DNA profiles from cases with touched and handled item evidence –victim elimination samples must be collected, analyzed and compared to evidence profiles – plus the fact that these crimes are lower level crimes that do not contribute to a suspect's third strike, this data will likely be used in the future to make recommendations to the police agencies in our county, regarding whether or not they should collect this type of evidence from vehicle burglary cases to be submitted to the lab for analysis. A similar evaluation can be done with other types of cases as the laboratory is evaluating their resources.

5. Implications for Policy and Practice

With the advancement of DNA technology and its forensic use within the criminal justice system, society has greatly benefited by the increase in the safety of its citizens. While forensic DNA analysis has greatly enhanced the identification and prosecution of serious and violent criminals, it's potential to identify the perpetrators of property crimes is currently underutilized. At least 32.7% of the violent criminals have criminal histories consistent with the commission of property crimes.[6] The results from Denver's participation in the NIJ Property Crime Expansion project, demonstrated a 12 percent decrease each year in the commission of property crimes. Denver officials noted that the identification and prosecution of habitual burglars not only reduced crime but saved city resources.[7]

[6] Reaves, Brian A. "Violent Felons in Large Urban Counties." Bureau of Justice Statistics [BJS] Special Report [US Dept of Justice] July 2006: 2.

[7] Roman, John K, et al., "The DNA Field Experiment: Cost-Effectiveness Analysis of the use of DNA in the Investigation of High-Volume Crimes." The Urban Institute Study for NIJ [Washington, DC] March 2008: 4.

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A cooperative effort between police investigators, prosecutors and forensic scientists is necessary to effectively utilize limited DNA resources to solve property crime. The DNA Field Experiment concluded that profound changes in the way police, prosecutors and crime laboratories interact is required to efficiently use DNA in investigations. [8]

Training and regular feedback to police agencies provided an ongoing means of improving collection procedures. The triaging process fostered a cooperative effort that ensured that cases were being screened and prioritized appropriately before being analyzed. Increased high thru-put automation with dedicated forensic analysts teams increased the labs ability to produce timely analysis results and upload of DNA samples so that subjects under investigation could be quickly cleared and perpetrators identified at the early stages of an investigation. While the increase in case output cannot be traced directly to any one particular process or event, the cumulative effect of the various strategies employed in the County including triaging, the increased use of automation, the addition of new personnel and the conversion to a flexible batching schedule together increased the efficiency of OCCL's DNA Unit.

[8]Roman, John K, et al., "The DNA Field Experiment: Cost-Effectiveness Analysis of the use of DNA in the Investigation of High-Volume Crimes." The Urban Institute Study for NIJ [Washington, DC] March 2008: 152.

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Attachment A

Orange County Forensic DNA Assessment Study: An Evaluation of the DNA Analysis Requirements of the County's Law Enforcement Agencies

Report prepared by the Staff of the OCDA DNA Unit

January 12, 2009

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Acknowledgements

This report was completed with the cooperation of the County's law enforcement professionals who participated in our written survey and met with us in person, in a joint effort, to quantify the County's Forensic DNA analysis needs.

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Introduction

The purpose of this report is to examine and project the County's law enforcement forensic DNA analysis requirements for the processing of probative biological crime scene evidence. Inherent within this goal, there is a recognition that much diversity exists among the County's police agencies regarding the utilization of forensic DNA technology. Concomitantly, there exists an understanding among law enforcement personnel of DNA analysis as both an emerging technology and a powerful tool to detect potential suspects and exonerate those innocent of a crime.

This report relies primarily on information gathered from a written DNA assessment survey completed by police agency personnel and through law enforcement interviews conducted with investigatory and CSI staff members (see survey, Appendix A). Agencies were asked to provide crime data over a three year period from 2005 to 2007. Completed surveys were returned by all of the County's law enforcement agencies.[1][2][3] At the time of this report, interviews were conducted with personnel at fifteen of twenty-two of the County's police departments.

The survey results are provided in table form at the end of this report. Appendix B contains a breakdown of the total number of crimes by type for each police agency from 2005 to 2007. Appendix C details the percentage of cases with DNA evidence collected by case type for each police agency from 2005 to 2007. [4]

For clarification purposes, it should be noted that the County's law enforcement agencies rely, almost exclusively, on the Orange County Crime Laboratory for their DNA processing needs. Survey responses from police agencies regarding the number of unsolved cases with potential DNA evidence are, for the most part, best described as "educated estimates." At the time of this report, many police departments did not have a system in place to accurately track the number of unsolved cases with possible biological evidence. A substantial number of the

[1] Although they are included in California Department of Justice statistics for the County of Orange, the assessment survey was not sent to the following agencies: UCI, CSUF, OCDPR, Fairview State Hospital, UPR and CHP

[2] OC Sheriff statistics include the unincorporated areas of Orange County and the cities of; Aliso Viejo, Dana Point, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, San Juan Capistrano, Stanton, and Villa Park

[3] Brea statistics include the contract city of Yorba Linda

[4] FBI Crime Statistics and Uniform Crime report figures were examined and compared to survey assessment response data

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agencies did not accurately track the number or status of DNA analysis requests made to the crime lab. Some survey respondents indicated that the production of accurate data would be near-impossible or would require months or years to complete.

Methodology

For this evaluation of the County's current and future DNA analysis requirements, it was necessary to consider future probable crime rates. Through analysis of the provided survey data and knowledge of relevant economic, societal, and demographic factors, we were able to estimate how crime rates may change in Orange County this year. With the use of quantitative methods, we were able to identify some patterns in the data and use a trend projection regression analysis to make predictions of the number of crimes and, thus, the number of DNA samples that may be submitted to the crime lab for DNA analysis. The law enforcement assessment survey responses provided the primary data used to create all of the tables and charts in this report. This data includes agency provided crime rate information as well as the past DNA sample collection levels at each department.

Although we have attempted to provide an approximation of the County's law enforcement forensic DNA analysis requirements, it must be stated that crime forecasting is a difficult endeavor. Large scale crime rate forecasts have been notoriously unreliable. Crime rates have been found to often rise when predicted to fall or fall when predicted to rise. We can examine trends in history and then use mathematical techniques to extrapolate future trends. However, accurately forecasting crime is very difficult to do using historical data and would ultimately require accounting for all factors that impact crime in our community. It is therefore nearly impossible to provide a complete crime forecast with a high degree of accuracy.

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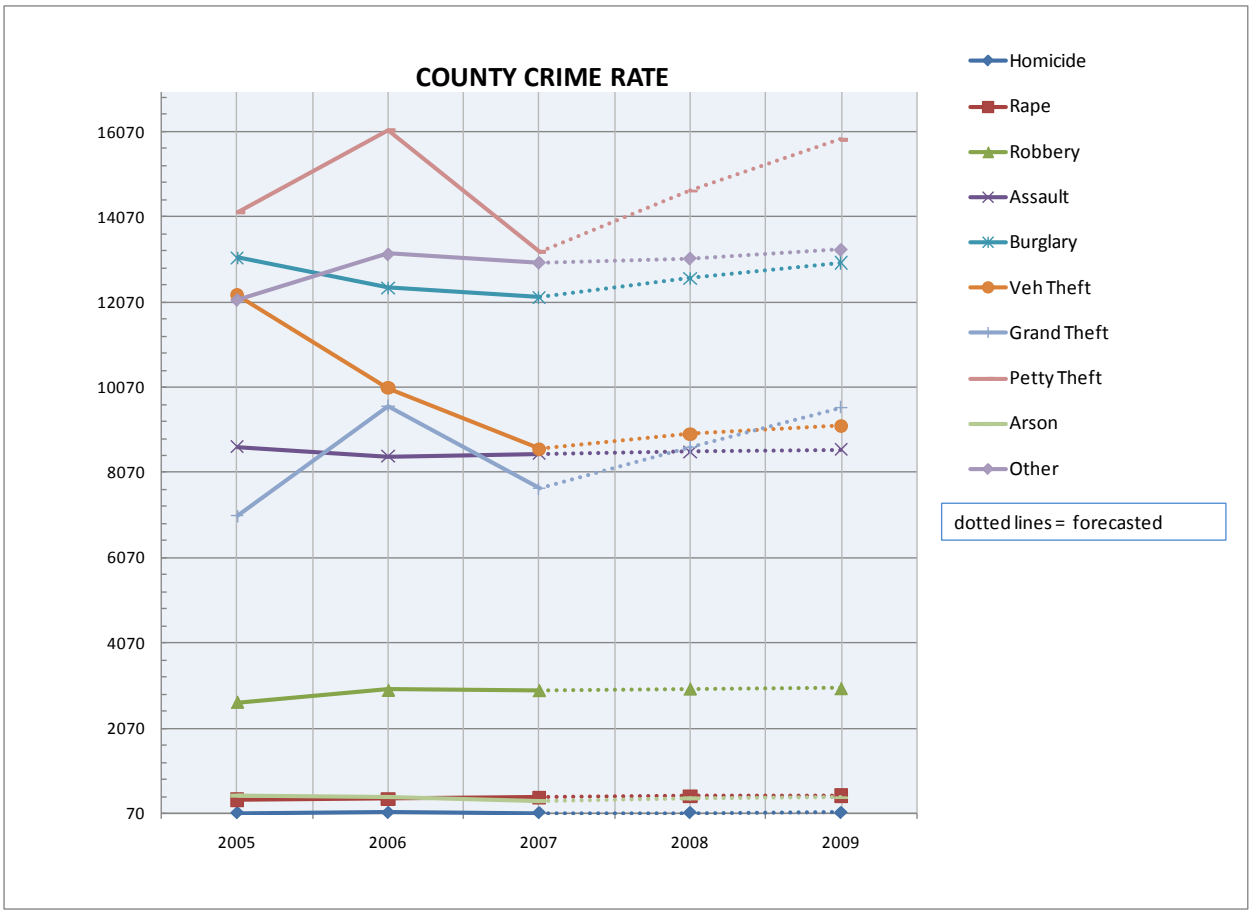
Current County Crime Statistics

The table below details the assessment survey responses of the total number of reported crimes from 2005 to 2007 and the projected total number of crimes for 2008[5] and 2009:

Figure 1



Appendix D contains the assessment survey results of the number of reported crimes by type from 2005 to 2007 and the projected number of crimes by type for 2008 and 2009. The past and forecasted crime rate numbers were derived from the survey responses received from the agencies. The past reported numbers may not match the numbers reported by the FBI *Uniform Crime Reports* or the California Department of Justice *Crime in California* reports. The numbers

[5] Complete actual 2008 statistics were not available at the time of this report

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will vary due to the manner that crimes are categorized in the different reports and the variations in the way agencies maintain their records.

A Determination of the Backlog of Unsolved Crimes in the County with Potential DNA Evidence

The backlog of unsolved crimes with potential DNA evidence was determined by examining the number of requests submitted to the crime lab and by the responses received from the assessment survey. The chart below details the number of backlog crime lab requests for DNA analysis as of December 2008:

Table I

CASES THE LAB HAS RECEIVED THAT ARE PENDING EXAMINATION		
TYPE OF CRIME	**NUMBER OF CASES**	**NUMBER OF EVIDENCE ITEMS**
Homicide	17	76
Rape	27	86
Robbery	43	115
Assault	24	49
Burglary / Thefts (combined)	2483	8117
Arson	4	13
Other	98	228
TOTALS:	2696	8684

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The table below contains the assessment survey results of the breakdown of the total number of unsolved cases with possible DNA evidence for which no request has yet been made for DNA analysis:

Table II

AGENCY	TOTAL OPEN CASES WITH POSSIBLE DNA EVIDENCE FOR WHICH, NO REQUEST HAS BEEN SENT TO THE LAB									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	9	4	2	X	X	0	X	X	X	X
BREA/YORBA LINDA	0	0	0	0	100	10	25	25	0	0
BUENA PARK	3	6	0	0	0	0	0	0	0	0
COSTA MESA	0	0	0	5	35	5	0	0	0	24
CYPRESS	2	0	5	0	175	40	5	5	0	0
FULLERTON	0	0	X	X	X	X	X	X	X	X
FOUNTAIN VALLEY	0	0	X	X	X	X	X	X	X	X
GARDEN GROVE	X	X	X	X	X	X	X	X	X	X
HUNTINGTON BEACH	0	0	0	0	0	0	0	0	0	0
IRVINE	0	0	0	0	0	0	0	0	0	0
LOS ALAMITOS	0	0	0	0	0	0	0	0	0	0
LAGUNA BEACH	2	4	0	2	2	0	0	0	0	0
LA HABRA	0	1	0	1	4	0	0	0	0	0
LA PALMA	0	0	0	0	0	0	0	0	0	0
NEWPORT BEACH	0	0	0	0	0	0	0	0	0	0
OC SHERIFF	0	0	10	25	0	28	40	80	0	0
ORANGE	1	0	0	0	0	0	0	0	0	0
PLACENTIA	6	20	35	50	50	20	20	20	10	0
SANTA ANA	0	0	0	0	0	0	0	0	0	0
SEAL BEACH	0	0	5	3	5	0	0	0	0	0
TUSTIN	0	0	1	0	13	7	9	21	0	0
WESTMINSTER	1	2	3	5	19	7	5	2	0	0

X = Not Available or Not Provided

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The chart below lists the percentage of unsolved rape cases, by agency, for which no request has yet been made for DNA analysis.

Table III

AGENCY	PERCENTAGE OF RAPE CASES - BY EVIDENCE TYPE FOR WHICH, NO REQUEST HAS BEEN SENT TO THE LAB		
	RAPE KITS ONLY	RAPE KITS AND OTHER DNA	OTHER DNA EVIDENCE ONLY
ANAHEIM	0-10	0-10	0-10
BREA/YORBA LINDA	0-10	0-10	0-10
BUENA PARK	0-10	0-10	0-10
COSTA MESA	0-10	0-10	0-10
CYPRESS	0-10	0-10	0-10
FULLERTON	26-50	51-75	11-25
FOUNTAIN VALLEY	0-10	0-10	0-10
GARDEN GROVE	0-10	0-10	0-10
HUNTINGTON BEACH	0-10	0-10	0-10
IRVINE	0-10	0-10	0-10
LOS ALAMITOS	0-10	0-10	0-10
LAGUNA BEACH	26-50	0-10	0-10
LA HABRA	51-75	51-75	0-10
LA PALMA	0-10	0-10	0-10
NEWPORT BEACH	11-25	0-10	0-10
OC SHERIFF	0-10	0-10	0-10
ORANGE	0-10	0-10	0-10
PLACENTIA	26-50	11-25	11-25
SANTA ANA	51-75	51-75	11-25
SEAL BEACH	0-10	0-10	0-10
TUSTIN	0-10	0-10	0-10
WESTMINSTER	0-10	11-25	0-10

Assessment survey results and December 2008 figures received from the Orange County Crime Laboratory indicate that the estimated total number of backlogged criminal cases with potential DNA evidence is 3720 cases.[6] The estimated number of unsolved homicide cases with potential DNA evidence for which police agencies have not yet requested DNA analysis is 24 cases. The estimated number of rape cases with potential DNA evidence for which police agencies have not yet requested DNA analysis is 37 cases. The estimated number of robbery and assaults with potential DNA evidence for which police agencies have not yet requested DNA analysis is 152 cases. The estimated number of high volume cases with potential DNA evidence for which police agencies have not yet requested DNA analysis is 777 cases.[7] These

[6] This figure does not include arson crimes and other miscellaneous offenses

[7] This figure includes burglaries, vehicle thefts, grand thefts and petty thefts

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figures involve both cases for which DNA analysis has been requested but not yet completed and cases for which no request has yet been made for DNA analysis.

The Capacity of the County's Police Agencies to Collect and Store Biological Evidence from Crime Scenes and Investigate DNA Generated Leads

The primary major obstacle to the collection, storage and processing of crime scene biological evidence is the lack of available funding and resources. Law enforcement professionals cited the limited number of trained CSI personnel, severely cramped evidence storage facilities and large investigation caseloads as factors they considered when determining their agency's forensic DNA policies.

Diverse DNA forensic policies have been adopted by various agencies. All agencies collect potential biological evidence at major crime scenes. Many collect DNA evidence from high volume crimes such as burglaries and vehicle thefts. A few agencies request that the crime lab conduct DNA analysis on all biological evidence collected at every crime scene. Other departments, based upon a number of varied factors, selectively forward requests for DNA analysis to the crime lab.

All agencies indicated an unwavering commitment to following-up and investigating each and every cold hit. If necessary, many departments stated they would reallocate personnel and resources to ensure that all viable DNA leads were fully investigated.

It should also be noted that almost all agencies expressed a desire to receive DNA training particularly in the area of the identification and collection of biological evidence at crime scenes. Universally, the policy maker at police departments evinced willingness to re-examine their existing forensic DNA policies in order to more fully utilize DNA technology to solve crime.

Projection of the County's Law Enforcement Forensic DNA analysis Requirements for the Processing of Probative Biological Crime Scene Evidence

Information, current as of December 2008, received from the Orange County Crime Laboratory indicates that the average number of DNA analyses generated from each biology case received within the laboratory is 17 DNA analyses per case. The phrase "DNA analyses" refers to each step of the DNA process that is conducted on a particular item or case. For example, if the biological item submitted is a single swab, that swab might typically undergo 6 DNA analyses steps. The average number of DNA analyses generated from each item received within the

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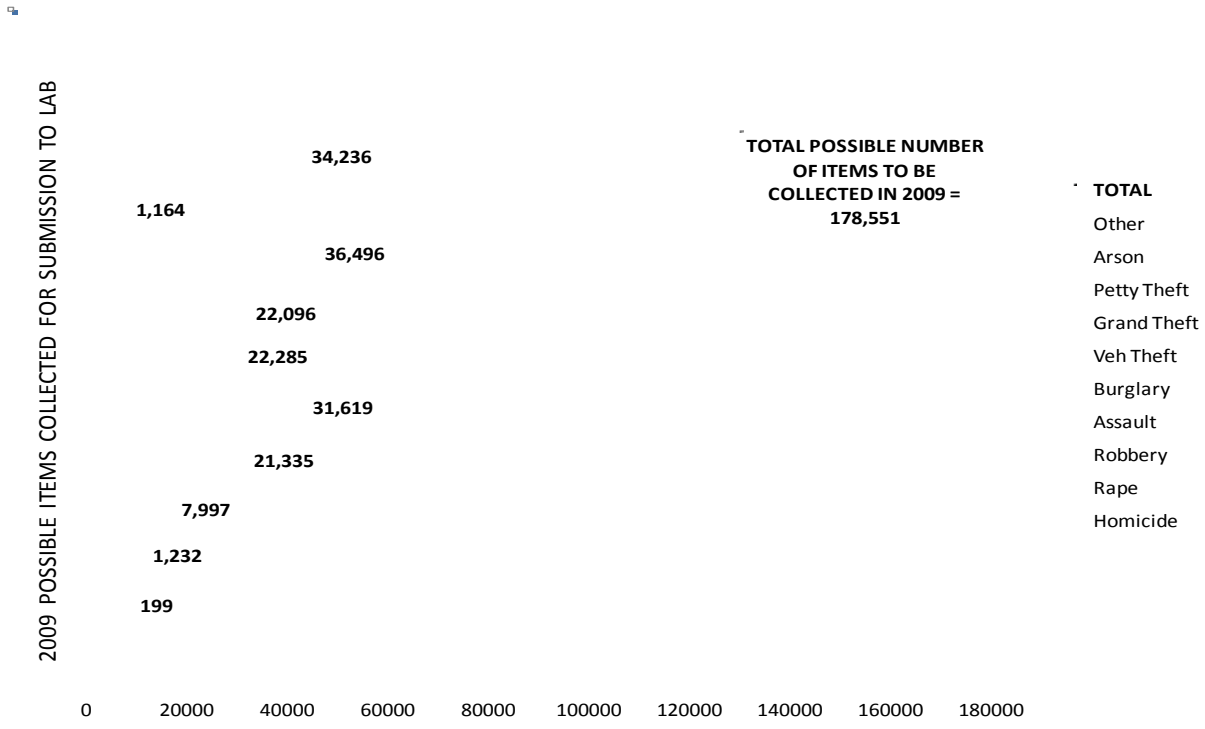
laboratory is 7 DNA analyses per item. Using these figures, the average number of items per biology case submitted is approximately 2.43 items per case.

An extreme scenario based on the premise that probative biological evidence is collected at every crime scene and requests for DNA analysis are made for every crime reported in the County can be examined. The chart below shows the possible number of DNA items that the lab may be tasked with processing if 2009 crime levels are as forecasted in this report and DNA is collected on every crime:

Figure 2



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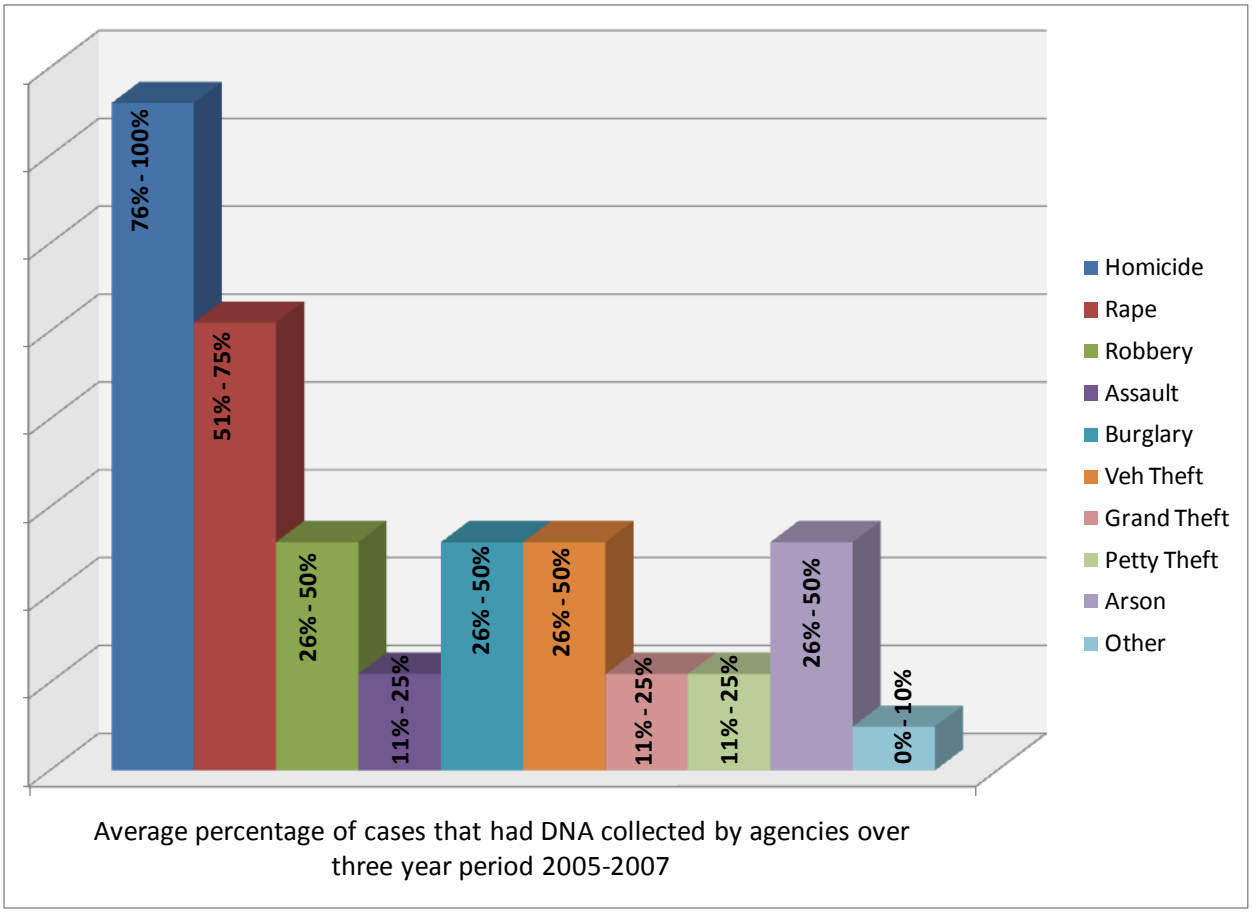
Another approach first determines the average percentage of cases that had DNA collected by police agencies over a three year period from 2005 to 2007. These percentages were reported by the agencies in the assessment survey.

Figure 3



Average percentage of cases that had DNA collected by agencies over three year period 2005-2007

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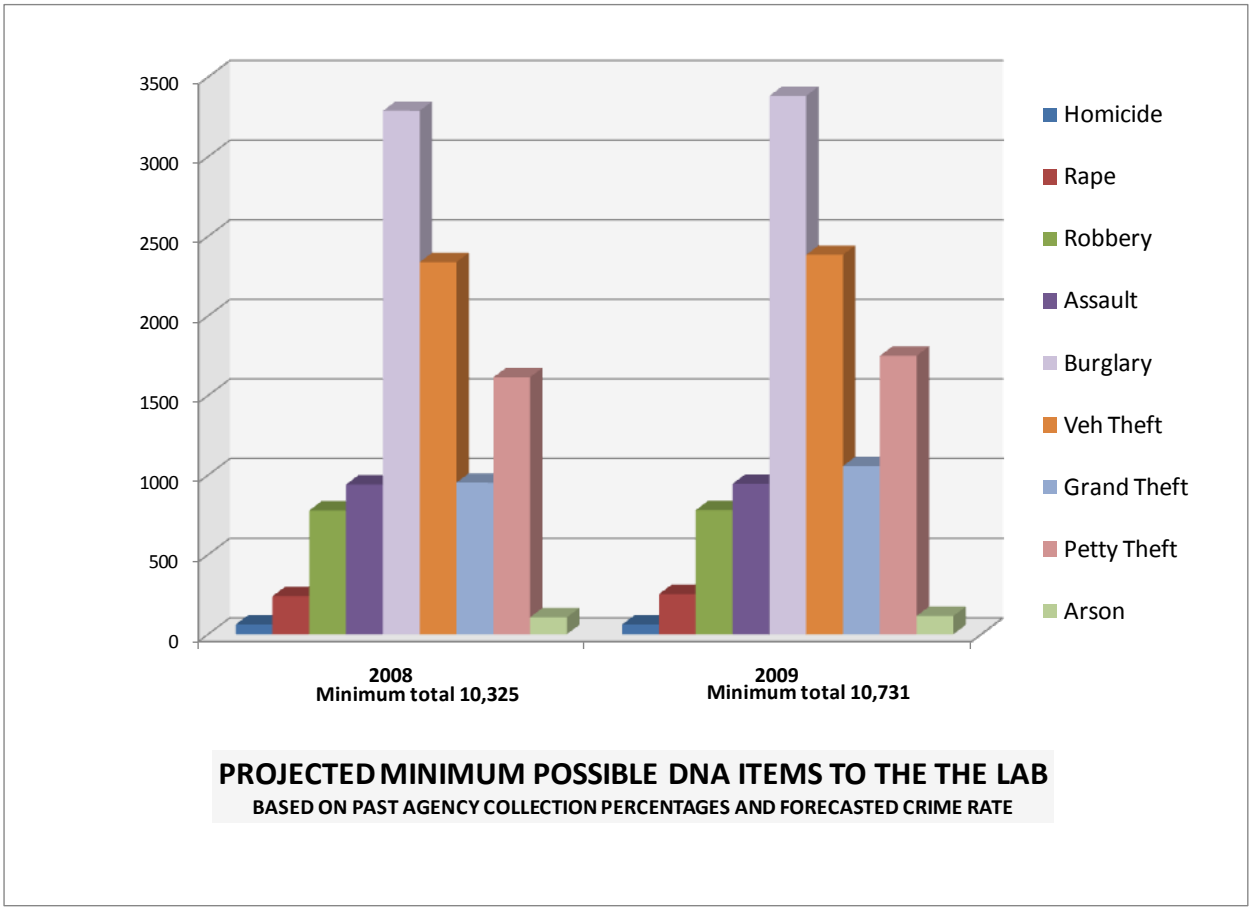
And then, applying that average, forecasts the total minimum possible number of items collected in 2008 and 2009:

Figure 4



The figures above can be compared to the actual total number of evidence items that were processed for DNA in 2008. As of December 2008, the actual total number of evidence items that were processed for DNA was 12,689 items, the backlog of cases in the lab was 2,696 cases and the evidence items from those backlog cases totaled 8,684 items.

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Conclusion

Embracing a measured approach, law enforcement agencies are adopting policies and procedures to more fully utilize forensic DNA technology to solve crime. Based on the interviews conducted with a majority of the County's law enforcement agencies, there is a strong expectation that DNA collection from volume property crime scenes such as burglaries and vehicle thefts will increase significantly over the next two years. Several departments plan to implement forensic DNA policy changes and begin collecting potential DNA samples at volume crime scenes. Other departments, in addition to designated non-sworn CSI personnel, are in the process of training police officers to collect DNA from volume crimes scenes.

The advances in forensic DNA technology, the 2009 implementation of a provision of Proposition 69 that allows for the collection of state database DNA samples from adult felony arrestees and increased successes in solving all types of crimes through DNA are just a few of the factors that will amplify the need for increasing the Orange County Crime Laboratory's capability to analyze biological samples from crime scenes.

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Appendix A

Forensic DNA assessment survey

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Forensic DNA Assessment

Please complete and fax by December 31, 2008 to:
Diane Baughman, OCDA Crime Analyst
FAX: 714-648-3655

1. In the chart below, please fill in the **total number** of occurrences for each year and type of offense listed
(do not include infractions):

	Homicide	Rape	Robbery	Assault	Burglary	Veh.Theft	Grand Theft	Petty Theft	Arson	Other
2005										
2006										
2007										

2a. For crimes investigated by your agency for January 1, 2005 to December 31, 2005, approximately what percentage had DNA evidence collected? **(Please check the appropriate box)**

	0% - 10%	11% - 25%	26% - 50%	50% - 75%	75% - 100%
Homicides with possible DNA					
Rapes with possible DNA					
Robberies with possible DNA					
Assaults with possible DNA					
Burglaries with possible DNA					
Vehicle thefts with possible DNA					
Grand thefts with possible DNA					
Petty thefts with possible DNA					
Arsons with possible DNA					
Other cases with possible DNA					

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2b. For crimes investigated by your agency for January 1, 2006 to December 31, 2006, approximately what percentage had DNA evidence collected? **(Please check the appropriate box)**

	0% - 10%	11% - 25%	26% - 50%	50% - 75%	75% - 100%
Homicides with possible DNA					
Rapes with possible DNA					
Robberies with possible DNA					
Assaults with possible DNA					
Burglaries with possible DNA					
Vehicle thefts with possible DNA					
Grand thefts with possible DNA					
Petty thefts with possible DNA					
Arsons with possible DNA					
Other cases with possible DNA					

Your best educated guess is always an appropriate response if exact numbers are not known.

2c. For crimes investigated by your agency for January 1, 2007 to December 31, 2007, approximately what percentage had DNA evidence collected? **(Please check the appropriate box)**

	0% - 10%	11% - 25%	26% - 50%	50% - 75%	75% - 100%
Homicides with possible DNA					
Rapes with possible DNA					
Robberies with possible DNA					
Assaults with possible DNA					
Burglaries with possible DNA					
Vehicle thefts with possible DNA					
Grand thefts with possible DNA					
Petty thefts with possible DNA					
Arsons with possible DNA					
Other cases with possible DNA					

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3. As of December 31, 2008, please fill in the **total number** of **open cases** *with possible DNA evidence* for which no request has been sent to a laboratory for DNA testing?

Homicide	Rape	Robbery	Assault	Burglary	Veh. Theft	Grand Theft	Petty Theft	Arson	Other

4. Of the open **rape** cases that are still in your control, (i.e., no request has been sent to a laboratory for DNA testing) how many have an associated rape kit? How many have other evidence in addition to a rape kit that could be tested for DNA? How many have only non-rape evidence that could be tested for DNA? (Please check the appropriate box)

	0% - 10%	11% - 25%	26% - 50%	50% - 75%	75% - 100%
Rape Kits Only					
Rape Kits and Other DNA					
Other DNA Evidence Only					

COMPLETED BY:

NAME_____TITLE_____AGENCY_____

PHONE_____FAX_____E-MAIL_____

Your best educated guess is always an appropriate response if exact numbers are not known.

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Appendix B

Total number of crimes by type for each police agency from 2005 - 2007

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AGENCY	2005 TOTAL CRIMES BY TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	10	55	565	971	1929	1660	2768*	2769*	79	0
BREA/YORBA LINDA	1	4	44	482	446	243	870*	870*	14	2420
BUENA PARK	2	14	124	X	448	436	520*	521*	0	0
COSTA MESA	3	32	119	856	601	569	952	1754	12	0
CYPRESS	1	6	28	134	178	128	711*	711*	3	2203
FULLERTON	0	15	75	634	386	289	691*	691*	X	0
FOUNTAIN VALLEY	1	6	30	191	303	196	332	552	10	0
GARDEN GROVE	6	22	229	488	803	1111	760	1831	1	0
HUNTINGTON BEACH	1	32	92	341	789	531	1391*	1392*	24	0
IRVINE	2	17	42	90	709	305	837	1374	30	0
LOS ALAMITOS	1	0	14	75	97	40	167	49	0	0
LAGUNA BEACH	0	7	8	30	150	44	190*	191*	0	0
LA HABRA	5	6	77	103	284	316	507*	507*	17	0
LA PALMA	1	3	12	59	115	35	59	96	2	0
NEWPORT BEACH	3	10	26	598	584	196	402	506	9	3057
OC SHERIFF	14	50	265	681	1957	960	2361	6328	113	0
ORANGE	2	2	100	121	537	581	1150*	1151*	0	0
PLACENTIA	3	8	30	266	229	140	148	228	12	0
SANTA ANA	17	74	644	1110	1194	3583	2757*	2758*	156	0
SEAL BEACH	0	1	9	96	105	53	111	235	0	45
TUSTIN	2	12	56	416	820	341	141	593	5	4447
WESTMINSTER	3	14	96	1033	561	536	899	870	9	0

X = Not Available or Not Provided

*Grand Theft and Petty Theft were provided as a combined total and split for purpose of this table

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AGENCY	2006 TOTAL CRIMES BY TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGALRY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	11	76	584	823	1886	1654	2638*	2639*	65	0
BREA/YORBA LINDA	0	13	47	469	437	222	893*	894*	20	2642
BUENA PARK	1	19	114	140	384	451	550*	551*	0	0
COSTA MESA	6	31	124	839	531	417	866	1609	11	0
CYPRESS	2	1	32	215	183	141	597*	597*	7	2112
FULLERTON	5	21	82	720	365	263	755*	755*	X	0
FOUNTAIN VALLEY	0	4	36	211	310	125	362	580	6	0
GARDEN GROVE	9	29	247	410	715	785	865	1800	3	0
HUNTINGTON BEACH	2	31	141	233	959	467	1522*	1522*	39	0
IRVINE	4	17	50	55	634	253	878	1289	35	0
LOS ALAMITOS	0	0	13	71	103	41	171	48	0	0
LAGUNA BEACH	0	6	8	35	142	46	217*	218*	1	0
LA HABRA	2	6	51	125	317	281	550*	550*	4	0
LA PALMA	0	2	12	57	89	19	31	84	3	0
NEWPORT BEACH	1	3	30	571	593	173	428	444	16	3601
OC SHERIFF	10	39	271	612	1699	953	2452	6237	156	0
ORANGE	1	13	147	137	549	433	1154*	1155*	0	0
PLACENTIA	1	3	26	246	214	94	148	161	5	0
SANTA ANA	26	73	787	1112	1075	2600	2478	2478	88	0
SEAL BEACH	0	1	11	81	105	55	124	237	0	56
TUSTIN	1	11	44	379	723	237	185	592	6	4845
WESTMINSTER	1	19	119	994	505	412	774	804	9	0

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AGENCY	2007 TOTAL CRIMES BY TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	17	70	581	728	1807	1275	2856*	2856*	41	0
BREA/YORBA LINDA	0	11	50	492	380	168	998*	999*	16	2677
BUENA PARK	3	12	133	171	429	520	571*	572*	0	0
COSTA MESA	1	40	78	932	510	413	855	1589	12	0
CYPRESS	1	5	38	107	206	146	571*	571*	6	1860
FULLERTON	5	18	98	637	449	251	690*	690*	X	0
FOUNTAIN VALLEY	0	8	40	215	328	123	410	581	5	0
GARDEN GROVE	8	35	262	340	865	648	971	1667	1	0
HUNTINGTON BEACH	0	29	102	245	795	415	1412*	1413*	42	0
IRVINE	4	19	44	76	637	215	992	1412	53	0
LOS ALAMITOS	0	0	16	78	84	34	150	77	0	0
LAGUNA BEACH	0	10	9	31	149	34	169*	170*	12	0
LA HABRA	3	19	66	156	305	214	466*	466*	3	0
LA PALMA	0	1	10	73	89	30	36	89	2	0
NEWPORT BEACH	1	4	53	609	659	150	459	436	9	3764
OC SHERIFF	7	58	275	692	1797	810	2665	5742	0	0
ORANGE	1	8	116	141	458	433	1079*	1079*	0	0
PLACENTIA	1	1	19	241	165	99	119	142	5	0
SANTA ANA	23	65	779	1080	1013	2100	2342*	2342*	120	0
SEAL BEACH	0	2	9	76	79	46	95	156	0	31
TUSTIN	2	16	65	425	533	183	166	695	13	4701
WESTMINSTER	2	19	125	1036	532	376	876	819	9	0

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Appendix C

Percentage of cases with DNA evidence collected by case type
for each police agency 2005 - 2007

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AGENCY	2005 PERCENTAGE OF CASES WITH DNA EVIDENCE COLLECTED - BY CASE TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	76-100	76-100	0-10	11-25	X	X	0-10	0-10	X	X
BREA/YORBA LINDA	76-100	76-100	51-75	0-10	26-50	26-50	11-25	11-25	0-10	0-10
BUENA PARK	26-50	51-75	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
COSTA MESA	76-100	26-50	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
CYPRESS	76-100	11-25	11-25	0-10	0-10	0-10	0-10	0-10	0-10	11-25
FULLERTON	76-100	51-75	11-25	26-50	11-25	11-25	11-25	0-10	X	0
FOUNTAIN VALLEY	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
GARDEN GROVE	26-50	51-75	11-25	0-10	11-25	11-25	0-10	0-10	0-10	0-10
HUNTINGTON BEACH	76-100	76-100	51-75	11-25	11-25	26-50	11-25	11-25	0-10	0-10
IRVINE	76-100	76-100	51-75	26-50	26-50	76-100	11-25	0-10	11-25	0
LOS ALAMITOS	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
LAGUNA BEACH	X	X	X	X	X	X	X	X	X	X
LA HABRA	26-50	51-75	0-10	0-10	11-25	0-10	0-10	0-10	0-10	0-10
LA PALMA	76-100	76-100	26-50	0-10	11-25	0-10	0-10	0-10	0-10	0-10
NEWPORT BEACH	11-25	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	11-25
OC SHERIFF	76-100	76-100	11-25	11-25	11-25	11-25	11-25	11-25	11-25	11-25
ORANGE	76-100	76-100	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
PLACENTIA	76-100	76-100	26-50	26-50	26-50	11-25	11-25	0-10	11-25	0-10
SANTA ANA	76-100	76-100	26-50	11-25	26-50	26-50	11-25	0-10	26-50	26-50
SEAL BEACH	76-100	76-100	26-50	0-10	26-50	51-75	11-25	0-10	0-10	0-10
TUSTIN	76-100	26-50	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
WESTMINSTER	76-100	51-75	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10

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AGENCY	2006 PERCENTAGE OF CASES WITH DNA EVIDENCE COLLECTED - BY CASE TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	76-100	76-100	0-10	11-25	11-25	X	0-10	0-10	X	X
BREA/YORBA LINDA	76-100	76-100	51-75	0-10	26-50	26-50	11-25	11-25	0-10	0-10
BUENA PARK	26-50	51-75	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
COSTA MESA	76-100	26-50	0-10	11-25	11-25	11-25	0-10	0-10	0-10	0-10
CYPRESS	76-100	11-25	11-25	0-10	0-10	0-10	0-10	0-10	0-10	11-25
FULLERTON	76-100	51-75	11-25	26-50	26-50	11-25	11-25	11-25	X	0-10
FOUNTAIN VALLEY	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
GARDEN GROVE	51-75	51-75	11-25	11-25	11-25	11-25	11-25	0-10	0-10	0-10
HUNTINGTON BEACH	76-100	76-100	51-75	11-25	11-25	26-50	11-25	11-25	0-10	0-10
IRVINE	76-100	76-100	51-75	26-50	26-50	76-100	11-25	0-10	11-25	0
LOS ALAMITOS	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0*10
LAGUNA BEACH	76-100	76-100	11-25	0-10	0-10	0-10	0-10	0-10	76-100	0-10
LA HABRA	26-50	26-50	11-25	26-50	0-10	0-10	0-10	0-10	0-10	0-10
LA PALMA	76-100	76-100	26-50	0-10	11-25	0-10	0-10	0-10	0-10	0-10
NEWPORT BEACH	11-25	11-25	11-25	11-25	11-25	0-10	11-25	11-25	0-10	11-25
OC SHERIFF	76-100	76-100	11-25	11-25	11-25	11-25	11-25	11-25	11-25	11-25
ORANGE	76-100	76-100	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
PLACENTIA	76-100	76-100	26-50	26-100	26-50	11-25	11-25	0-10	11-25	0-10
SANTA ANA	76-100	76-100	51-75	26-50	26-50	26-50	11-25	0-10	26-50	26-50
SEAL BEACH	76-100	76-100	11-25	0-10	11-25	11-25	11-25	0-10	0-10	0-10
TUSTIN	76-100	26-50	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
WESTMINSTER	76-100	26-50	11-25	0-10	0-10	0-10	0-10	0-10	0-10	0-10

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AGENCY	2007 PERCENTAGE OF CASES WITH DNA EVIDENCE COLLECTED - BY CASE TYPE									
	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY	VEH THEFT	GRAND THEFT	PETTY THEFT	ARSON	OTHER
ANAHEIM	76-100	76-100	11-25	11-25	11-25	0-10	0-10	0-10	X	X
BREA/YORBA LINDA	76-100	76-100	51-75	0-10	26-50	26-50	11-25	11-25	0-10	0-10
BUENA PARK	26-50	51-75	11-25	11-25	0-10	0-10	0-10	0-10	0-10	0-10
COSTA MESA	76-100	51-75	11-25	11-25	11-25	11-25	0-10	0-10	11-25	0-10
CYPRESS	76-100	11-25	11-25	0-10	51-75	51-75	51-75	11-25	0-10	0-10
FULLERTON	76-100	51-75	11-25	26-50	26-50	26-50	26-50	11-25	X	X
FOUNTAIN VALLEY	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
GARDEN GROVE	76-100	51-75	11-25	11-25	11-25	11-25	11-25	0-10	0-10	0-10
HUNTINGTON BEACH	76-100	76-100	51-75	11-25	11-25	26-50	11-25	11-25	0-10	0-10
IRVINE	76-100	76-100	51-75	26-50	26-50	76-100	11-25	0-10	11-25	0
LOS ALAMITOS	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
LAGUNA BEACH	76-100	76-100	11-25	0-10	0-10	0-10	0-10	0-10	0-10	0-10
LA HABRA	51-75	51-75	11-25	11-25	11-25	0-10	0-10	0-10	0-10	0-10
LA PALMA	76-100	76-100	26-50	0-10	26-50	0-10	0-10	0-10	0-10	0-10
NEWPORT BEACH	26-50	26-50	26-50	26-50	51-75	26-50	51-75	26-50	26-50	26-50
OC SHERIFF	76-100	76-100	11-25	11-25	11-25	11-25	11-25	11-25	11-25	11-25
ORANGE	76-100	76-100	11-25	0-10	0-10	0-10	0-10	0-10	0-10	0-10
PLACENTIA	76-100	76-100	26-50	26-50	26-50	11-25	11-25	0-10	11-25	0-10
SANTA ANA	76-100	76-100	51-75	26-50	51-75	51-75	11-25	0-10	26-50	51-75
SEAL BEACH	76-100	76-100	26-50	0-10	11-25	11-25	11-25	0-10	0-10	0-10
TUSTIN	76-100	26-50	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
WESTMINSTER	26-50	26-50	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10

X = Not Available or Not Provided

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Appendix D

Assessment survey results of the number of reported crimes by type from 2005 to 2007 and the projected number of crimes by type for 2008 and 2009

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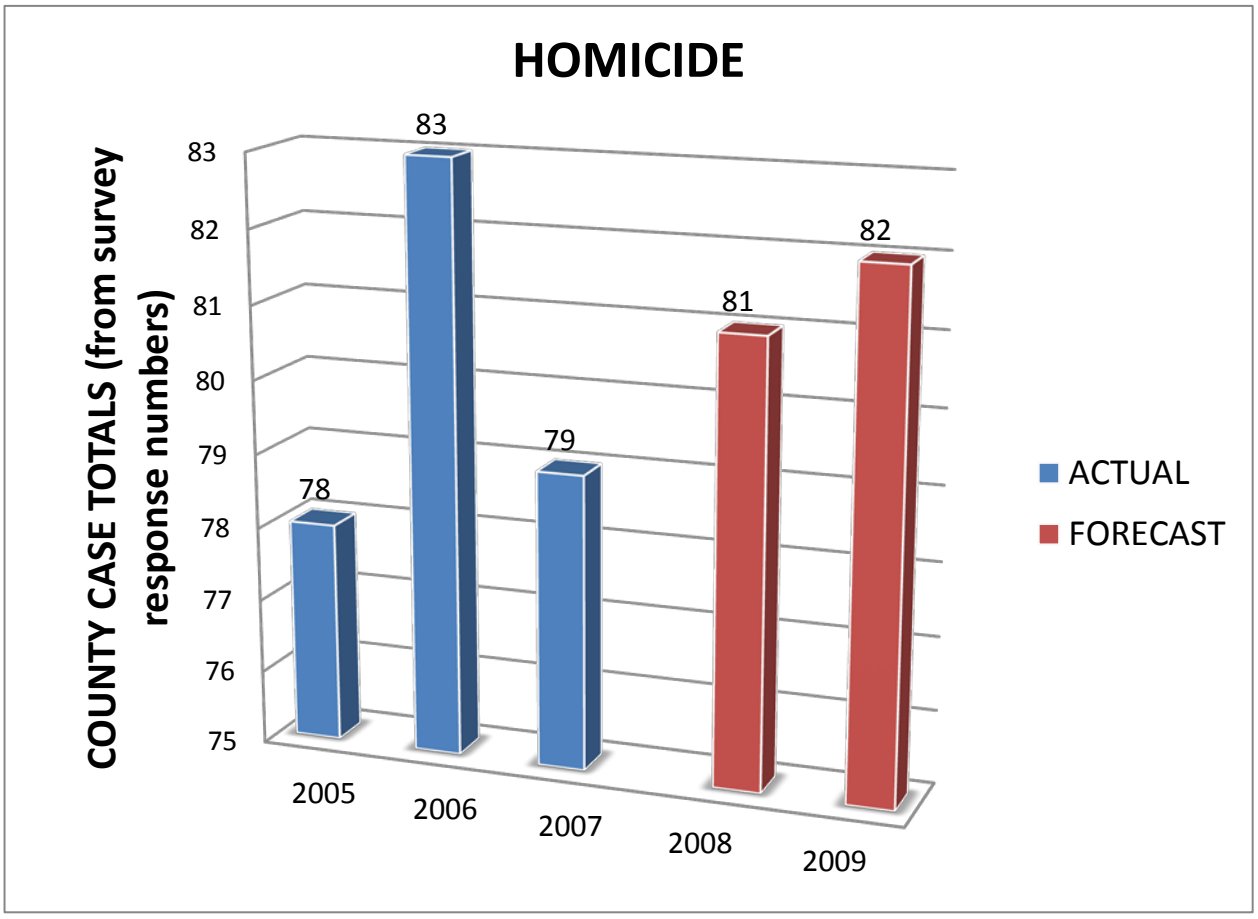

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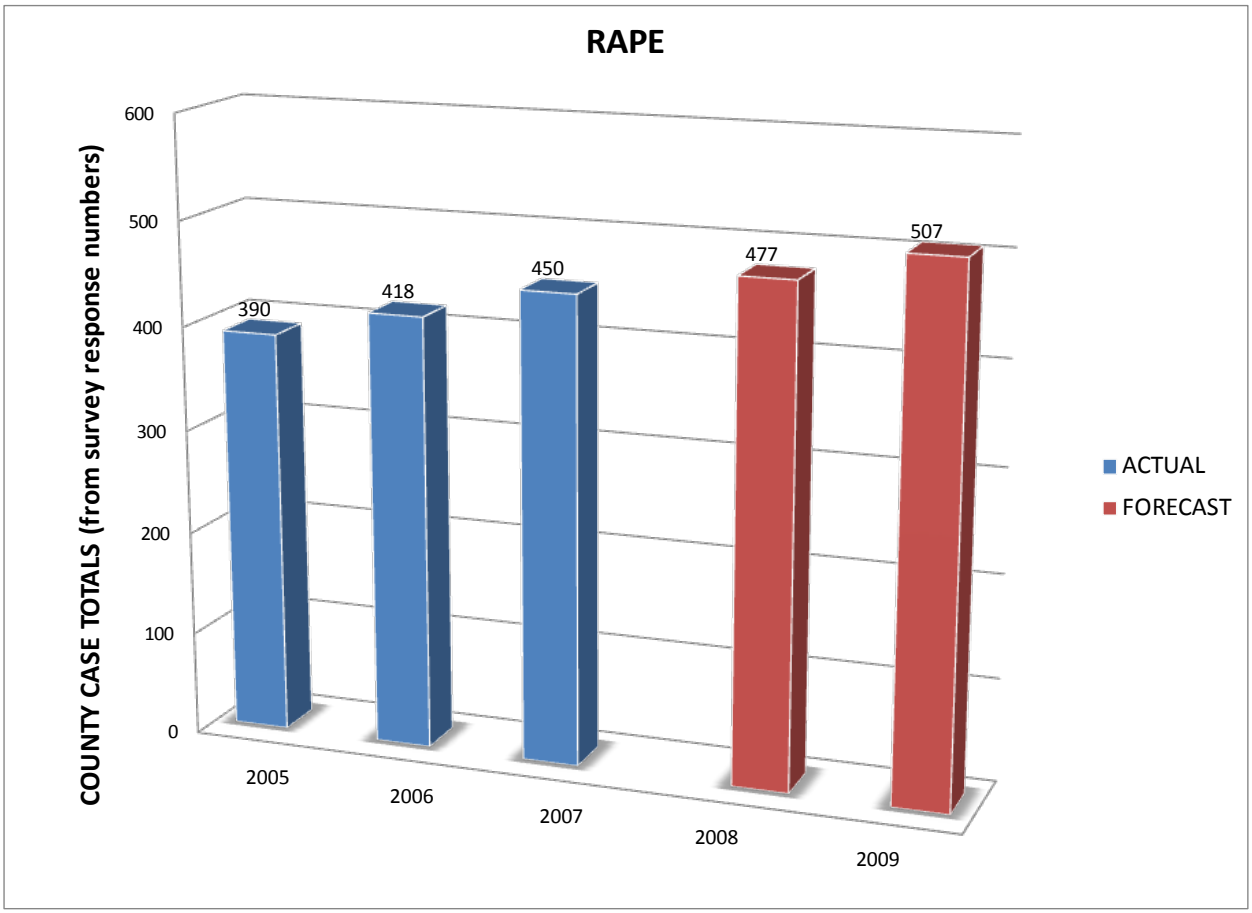

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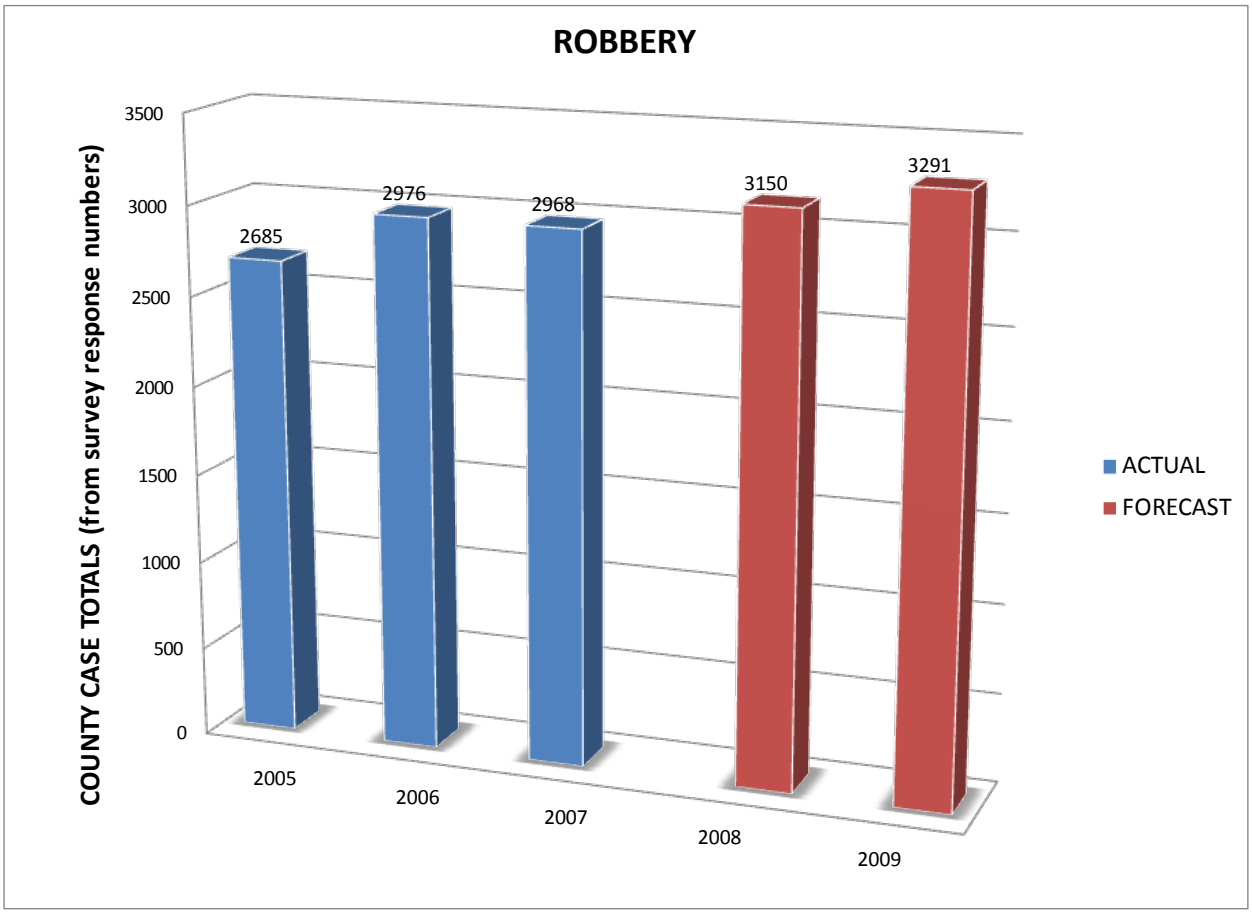

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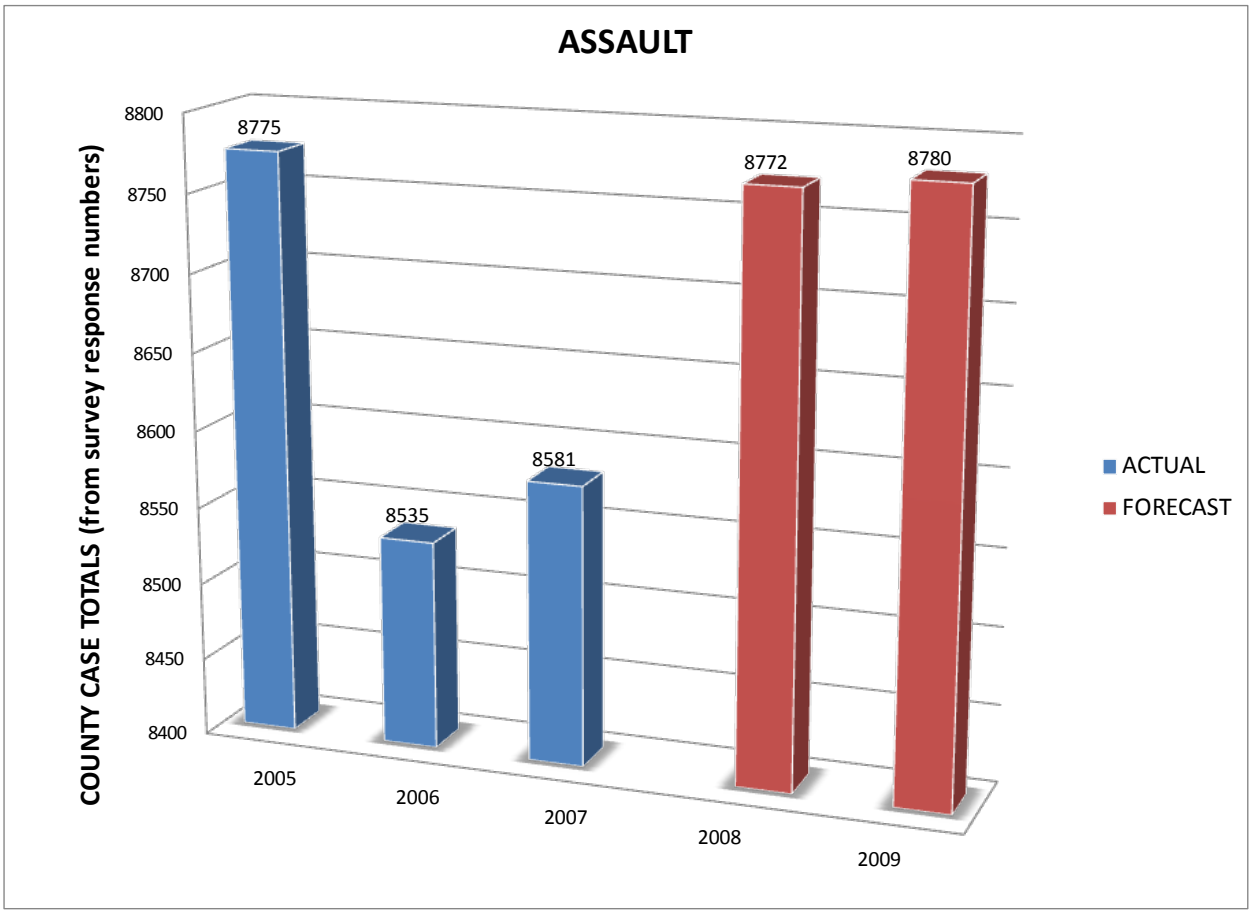

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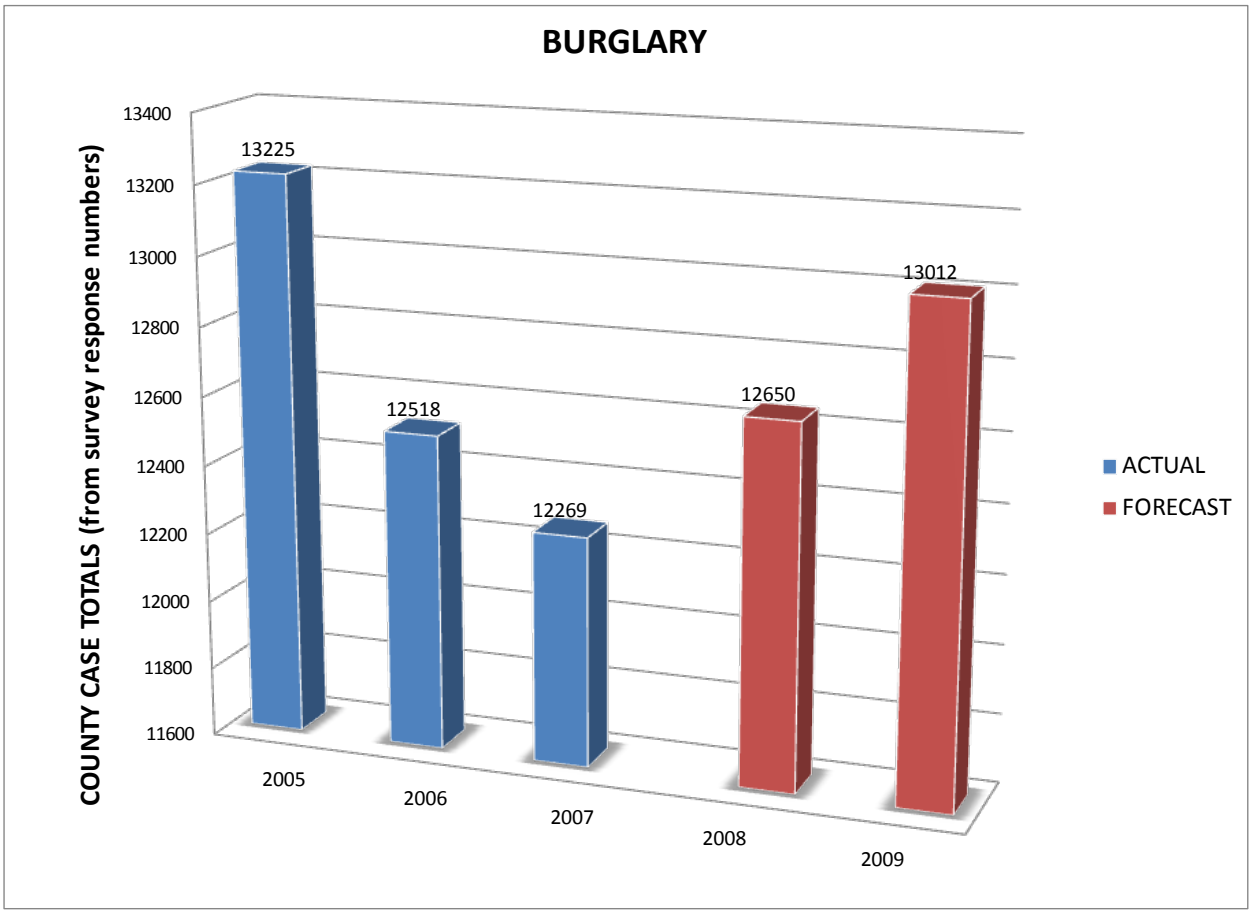

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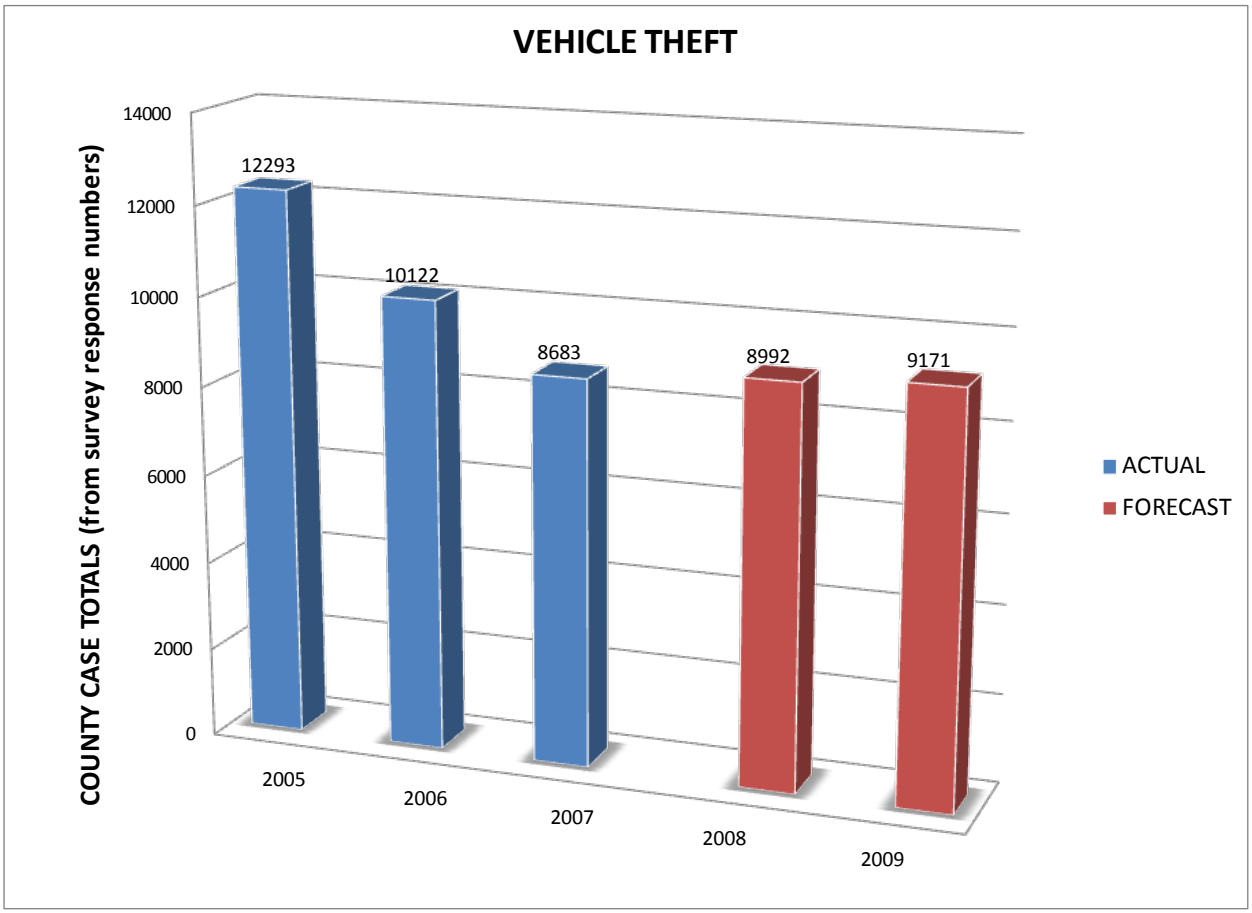

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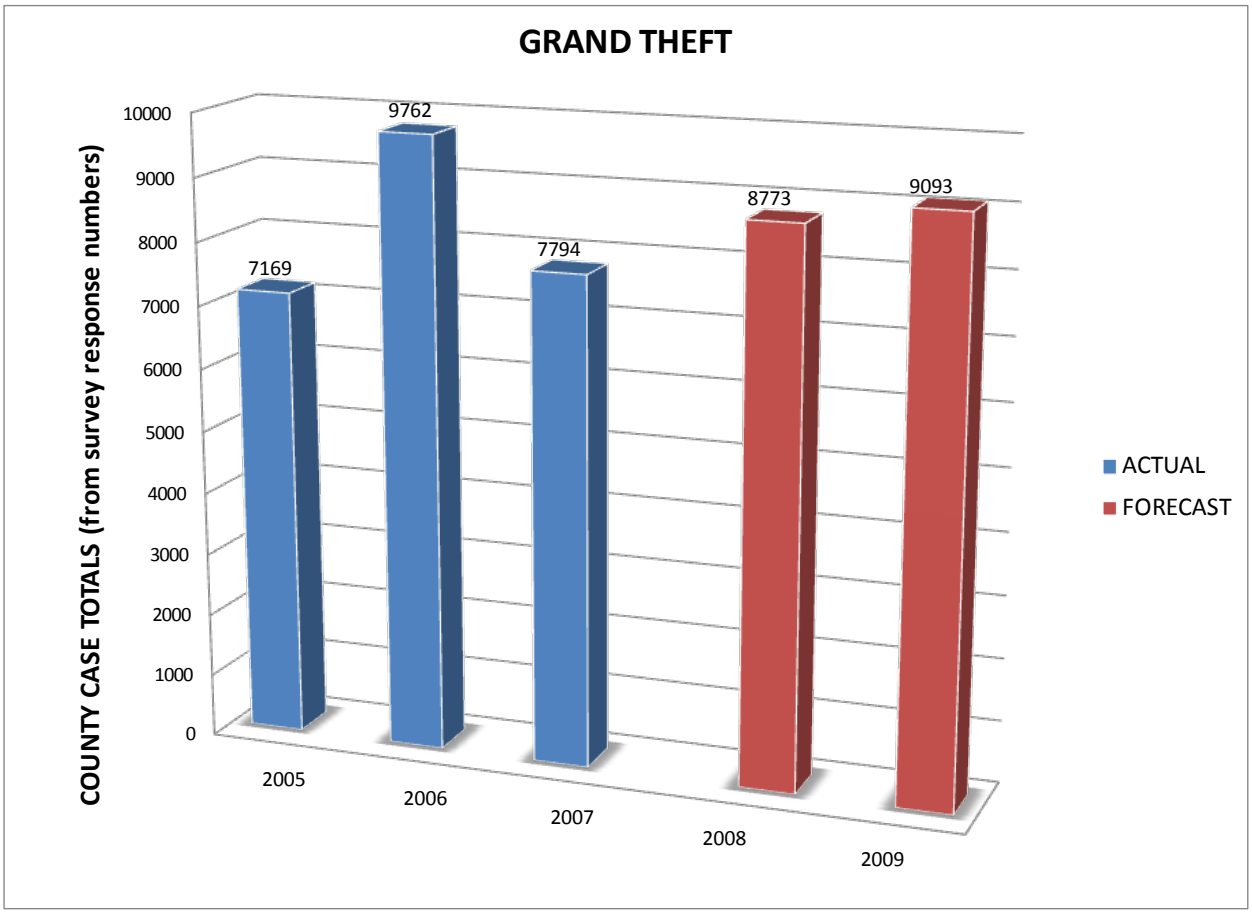

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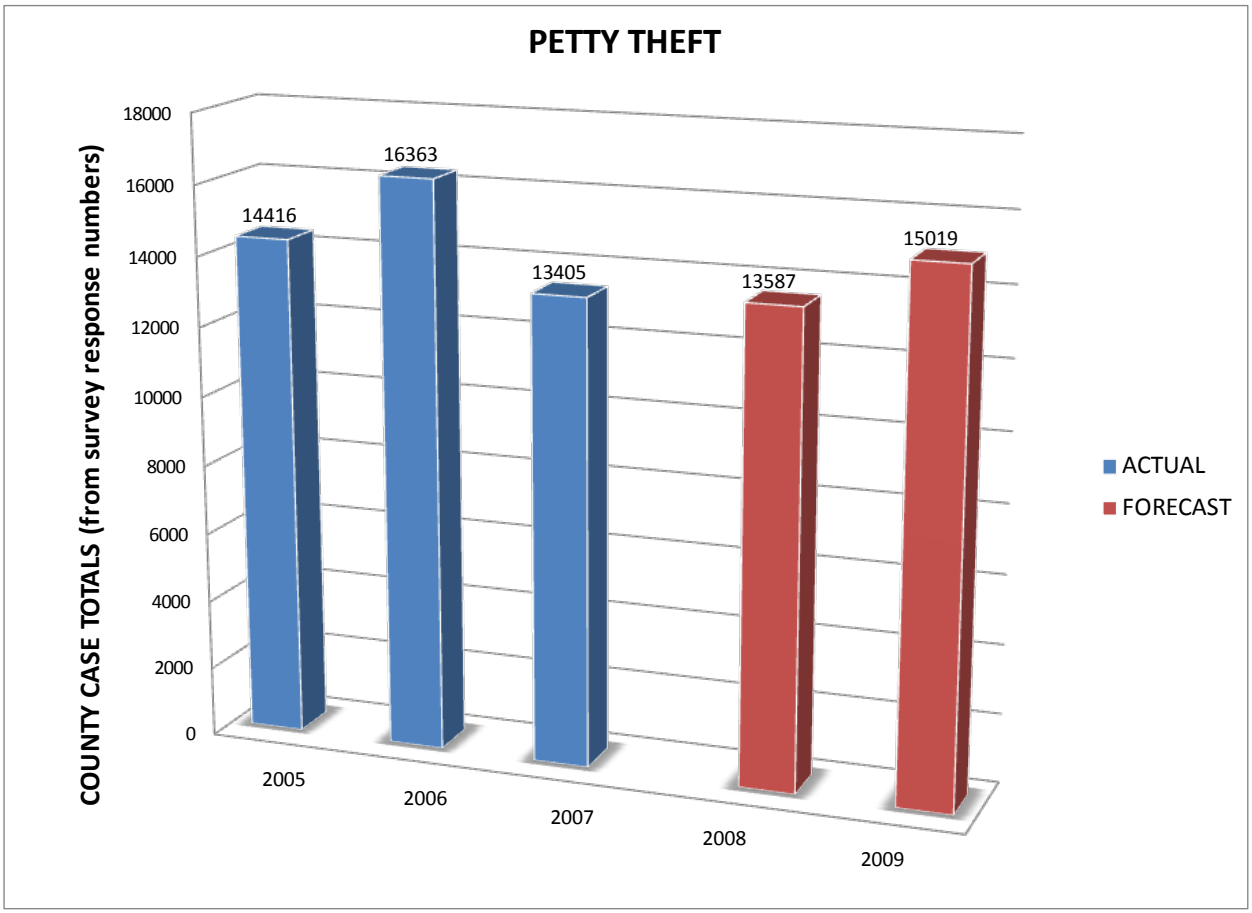

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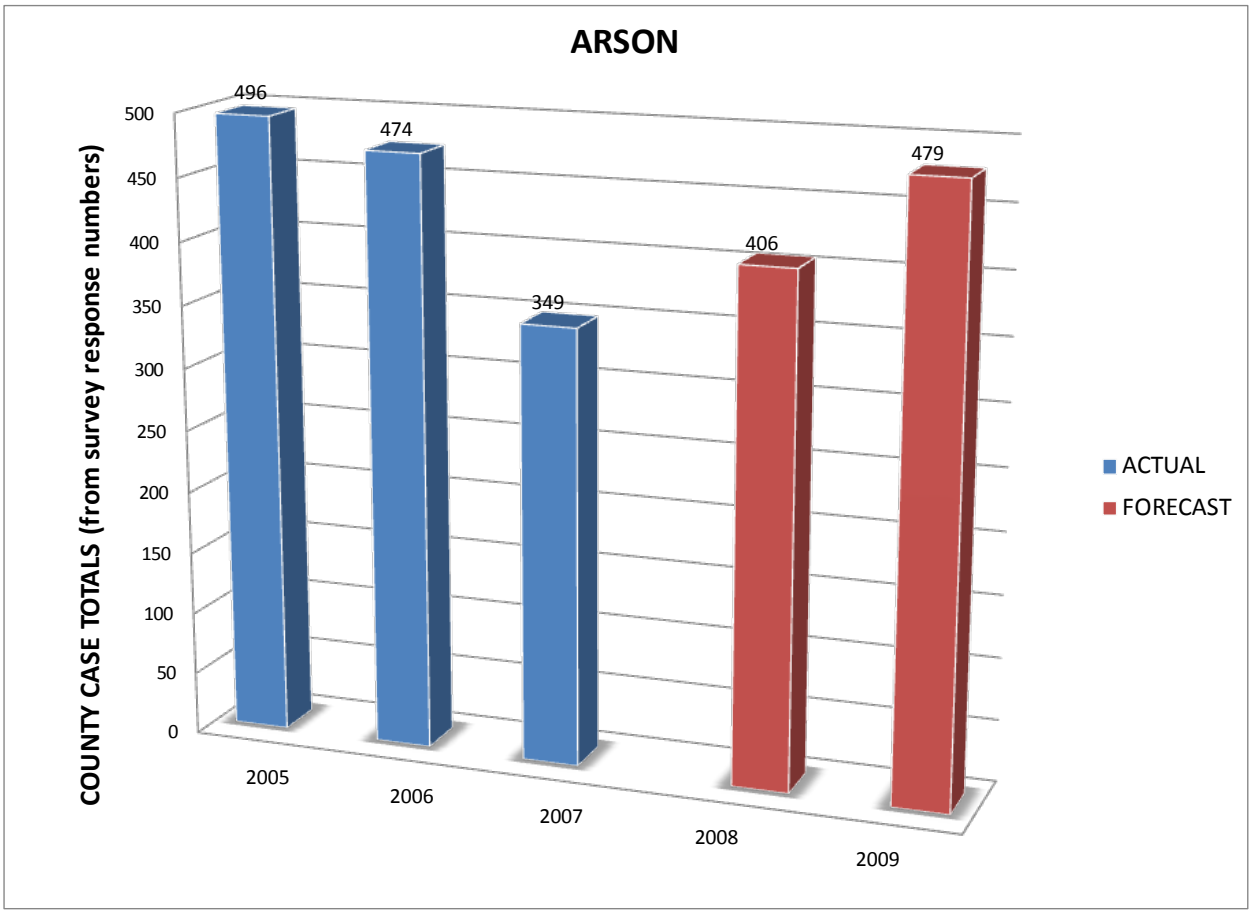

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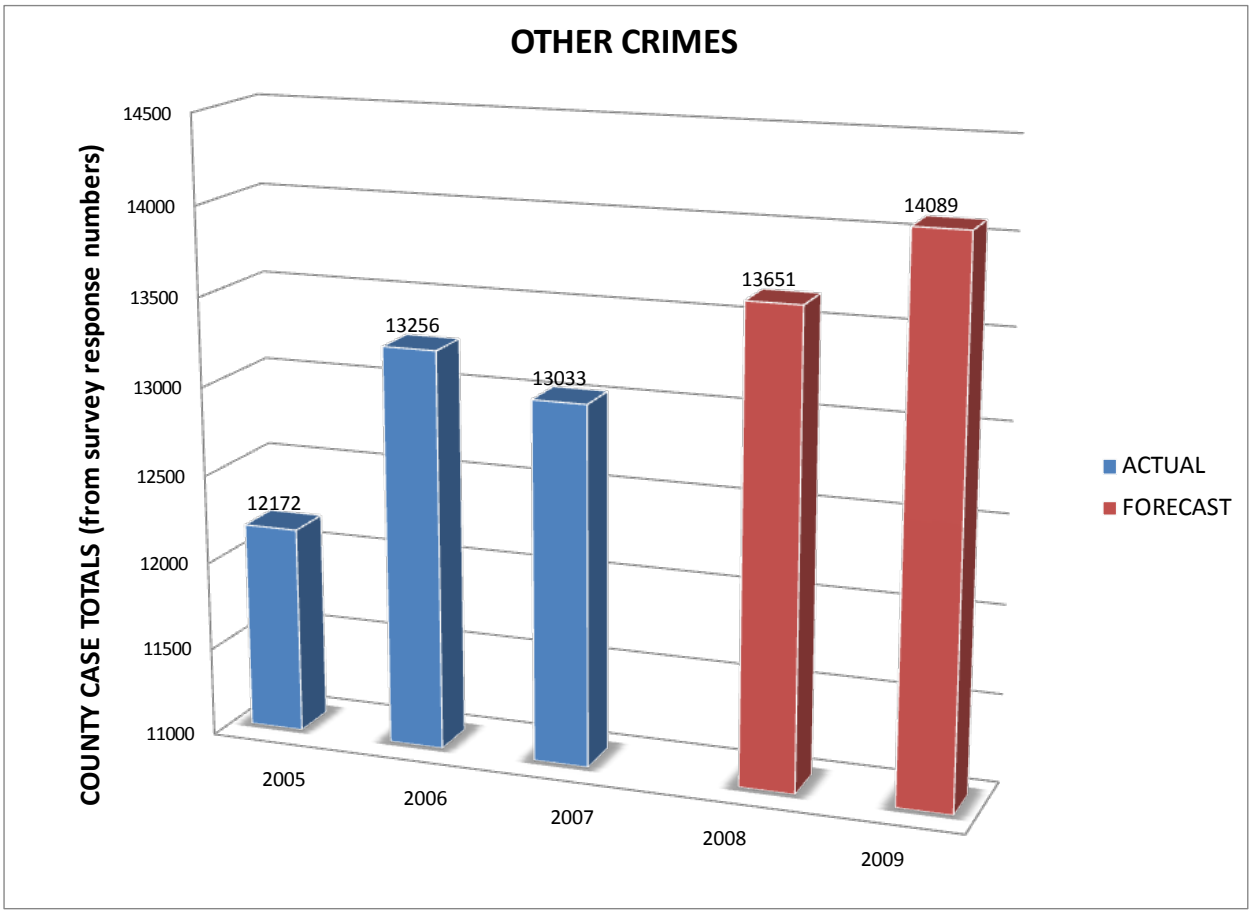

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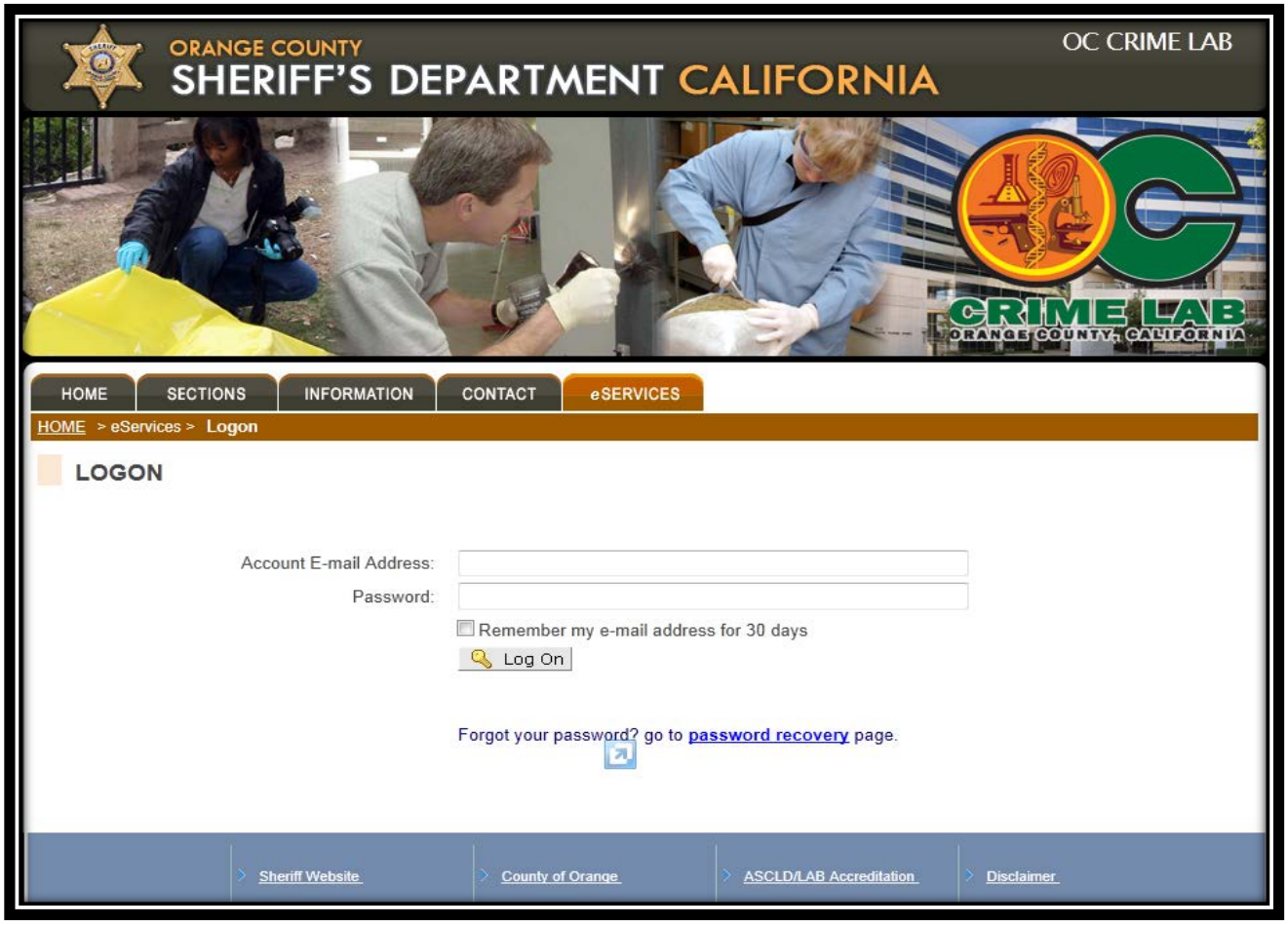
Attachment B

The Orange County Sheriff-Coroner Department, OC Crime Lab (OCCL), Work Request and Case Status (WRCS) Website Screenshots

WRCS Home Page



Investigators, CSI personnel, and Deputy District Attorneys can request an account to access the Work Request and Case Status Website (WRCS). The accounts are issued by the Information Technology (IT) staff at the Orange County Crime Laboratory. Once an account is established, the agency representative can submit work requests to the supervisors of all of the laboratory's sections. They can also e-mail information to laboratory personnel regarding their requests, and in the future, they will be able to use this site to check the status of their cases and obtain copies of laboratory reports.

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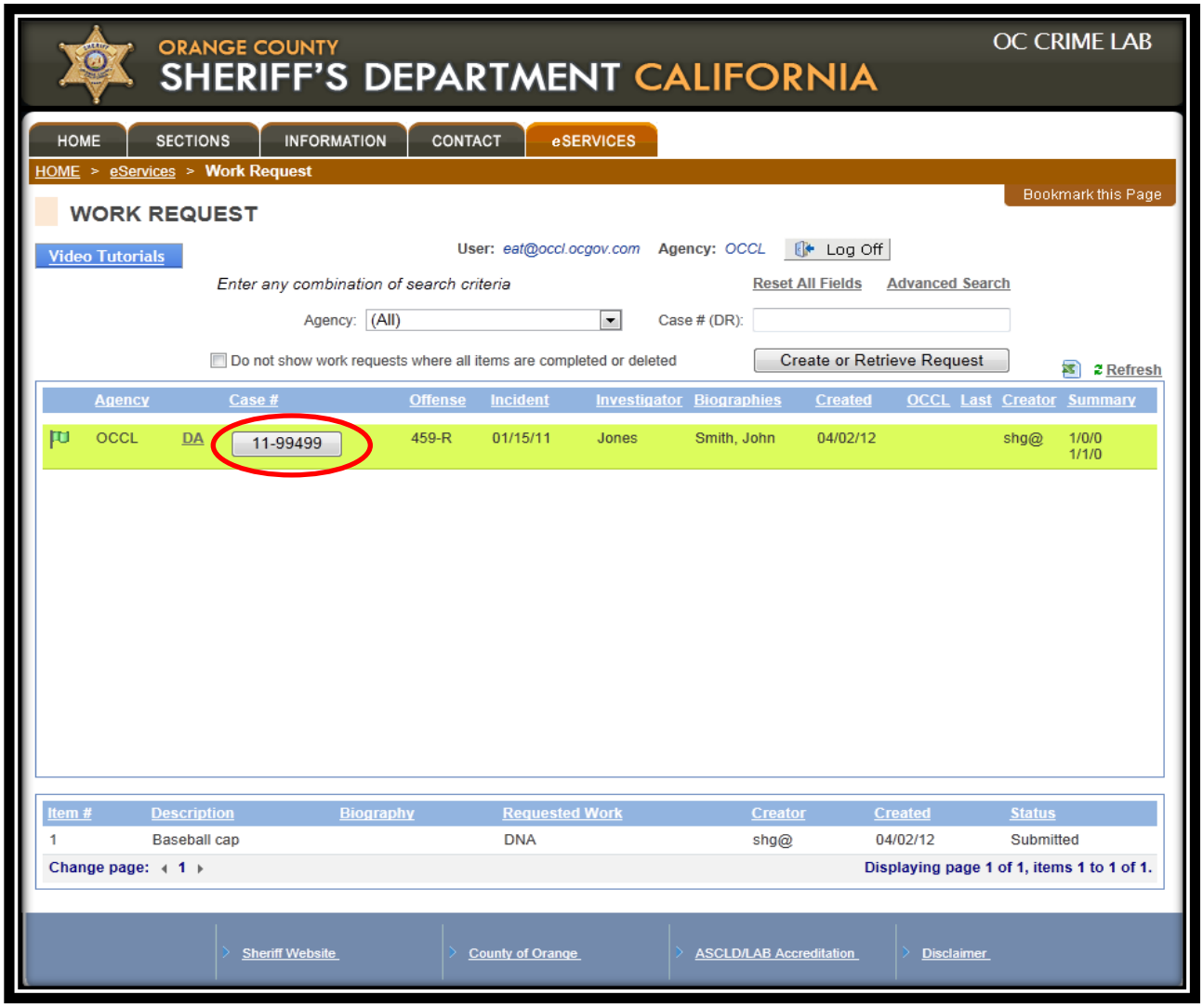
Work Request Page



At the bottom of the page, a description of the evidence item is listed along with the type of work requested. At this stage the request is only submitted and has not been triaged or accepted by the laboratory. Selecting the number in the case # box (circled in red) brings up the screen shot on the following page.

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Case and Investigator Information

This page contains the case and investigator contact information. Victim and suspect biographies are listed as well as related cases. At this stage, a DNA Supervisor may promote or accept a case to be worked or can wait until OCDA's personnel triages the item(s). The agency is required to attach a police report that provides case details including the types of evidence and where the items were located in the crime scene. Police reports are attached under "Associated Documents". Selecting the "edit" button prompts investigators with instructions on how to attach their reports. In the example above, the DA's "button" is marked as "Pending" in the "Status" section under "Work Request Items". Once personnel from the DA's office approve or reject the work request, the investigator and the DNA Supervisor receive an e-mail in the communication log and an audit trail begins. If the DA rejects the case, then the work request is cancelled. It can be resubmitted by the investigator at any time. If the DA accepts the case, then the DNA Supervisor promotes or accepts the case and the case information is forwarded to the Laboratory Information Management System (LIMS) and assigned a Forensic Report (FR) number.

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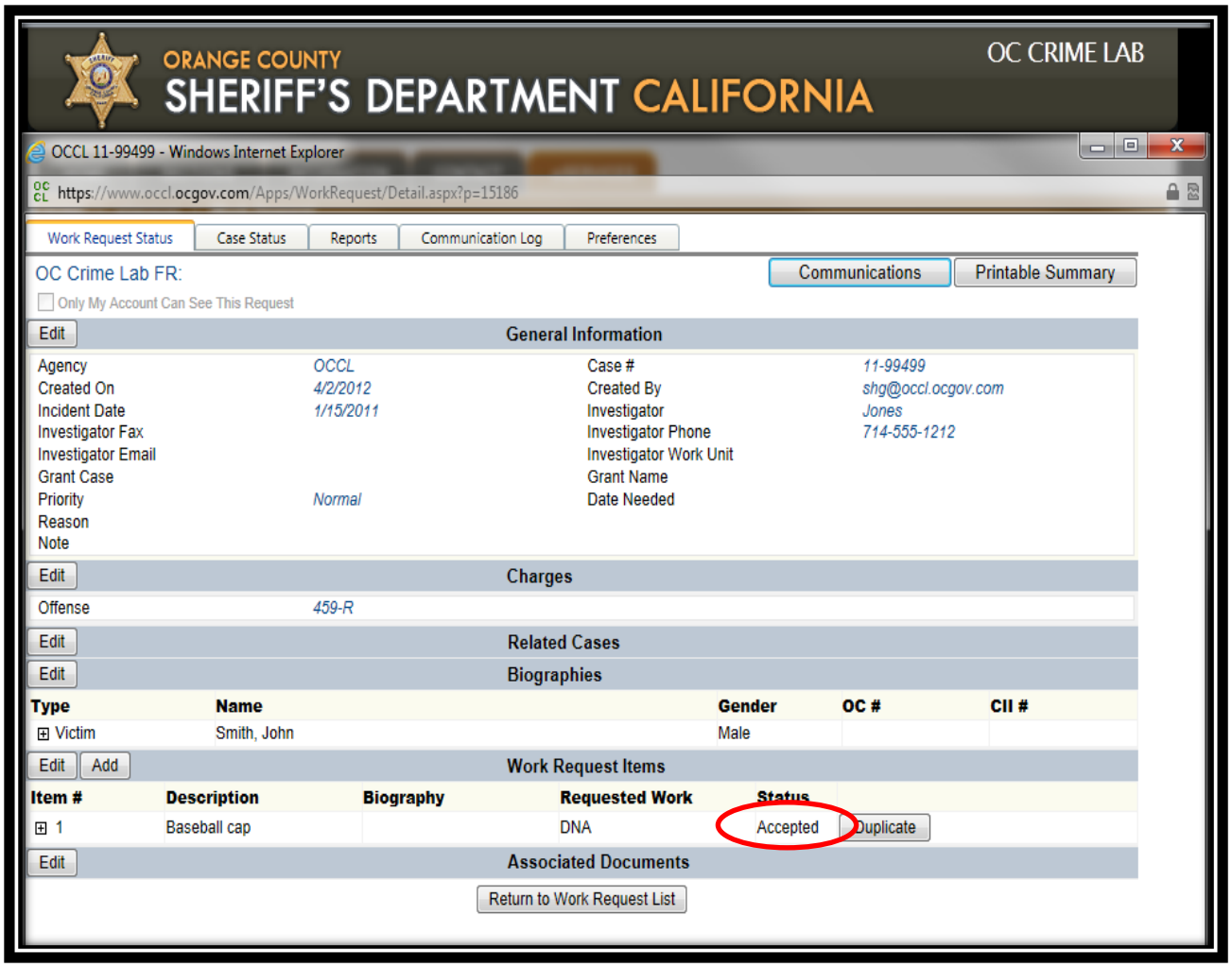
Work Request Status



After the case has been promoted by the DNA Supervisor, the "Status" under "Work Request Items" is now displayed as "Accepted". A summary page can be printed and given to the analyst when the case is assigned. See the example on the following page.

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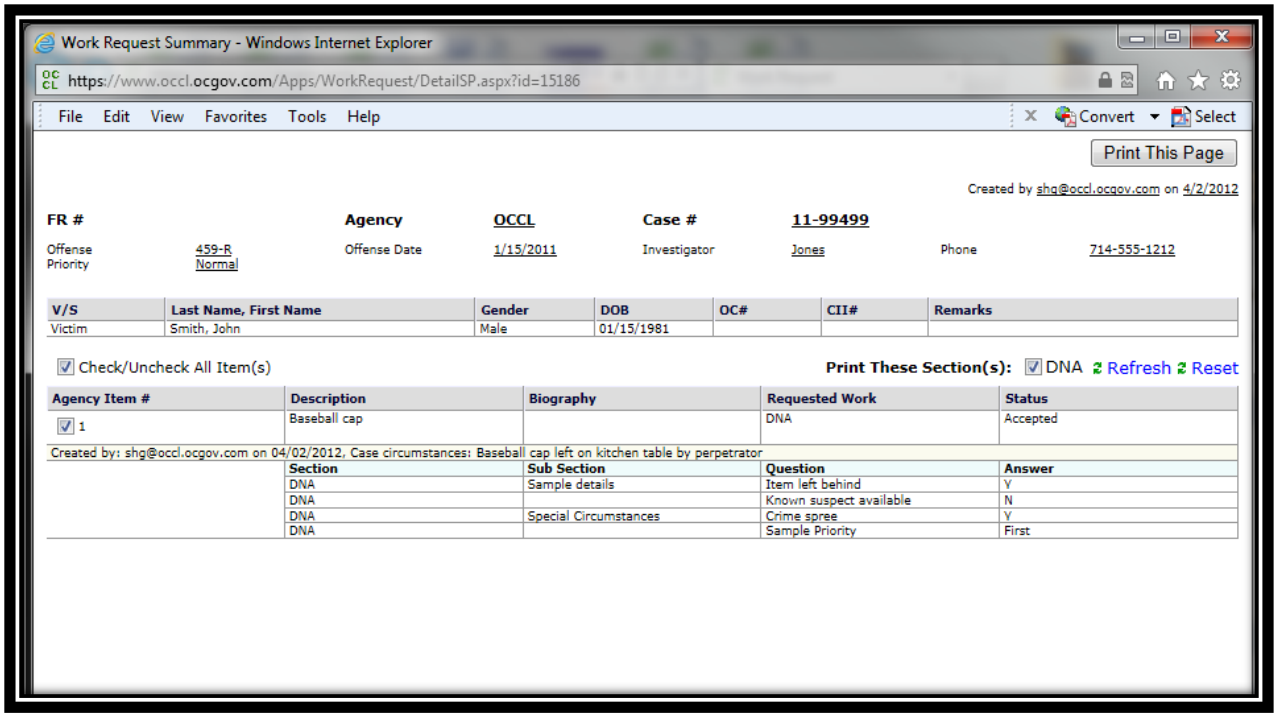
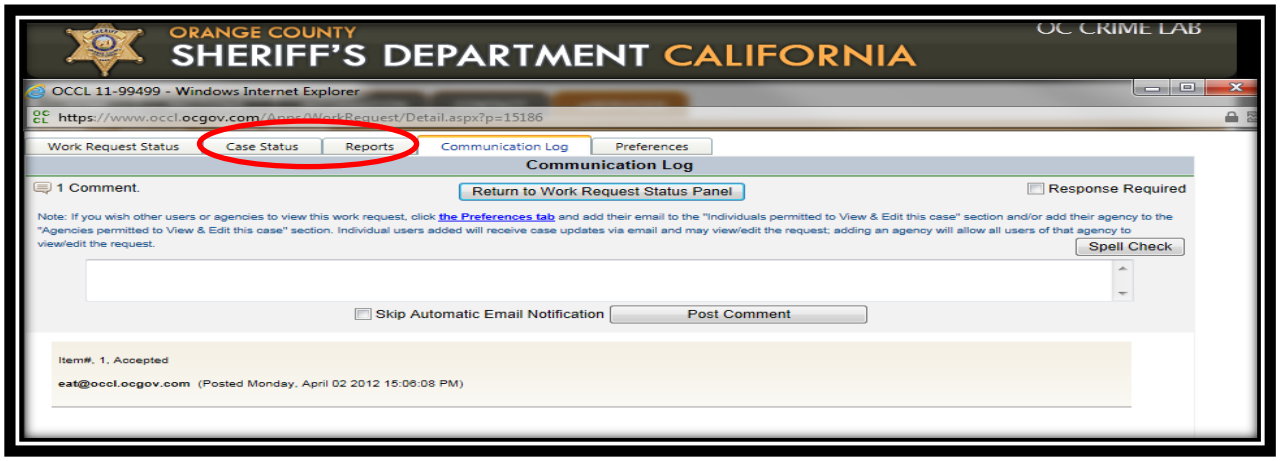
Work Request Summary





There are two tabs on the work site labeled “Case Status” and “Reports”. These tabs are not currently functional. When the programming is complete, investigators and DAs will be able to see the status of their cases in the laboratory and how far in the analytical process the evidence is. They will also be able to download case reports.

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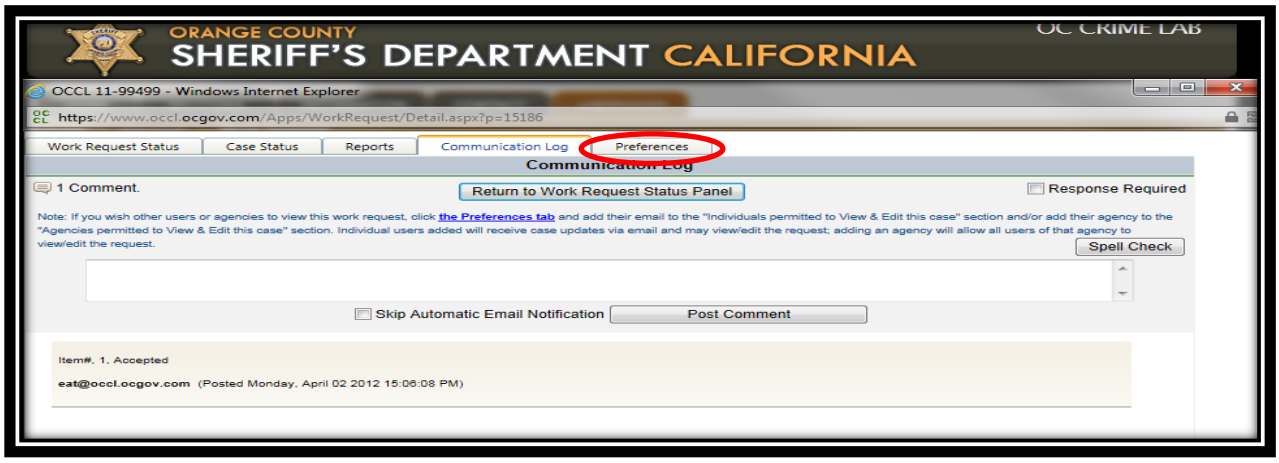
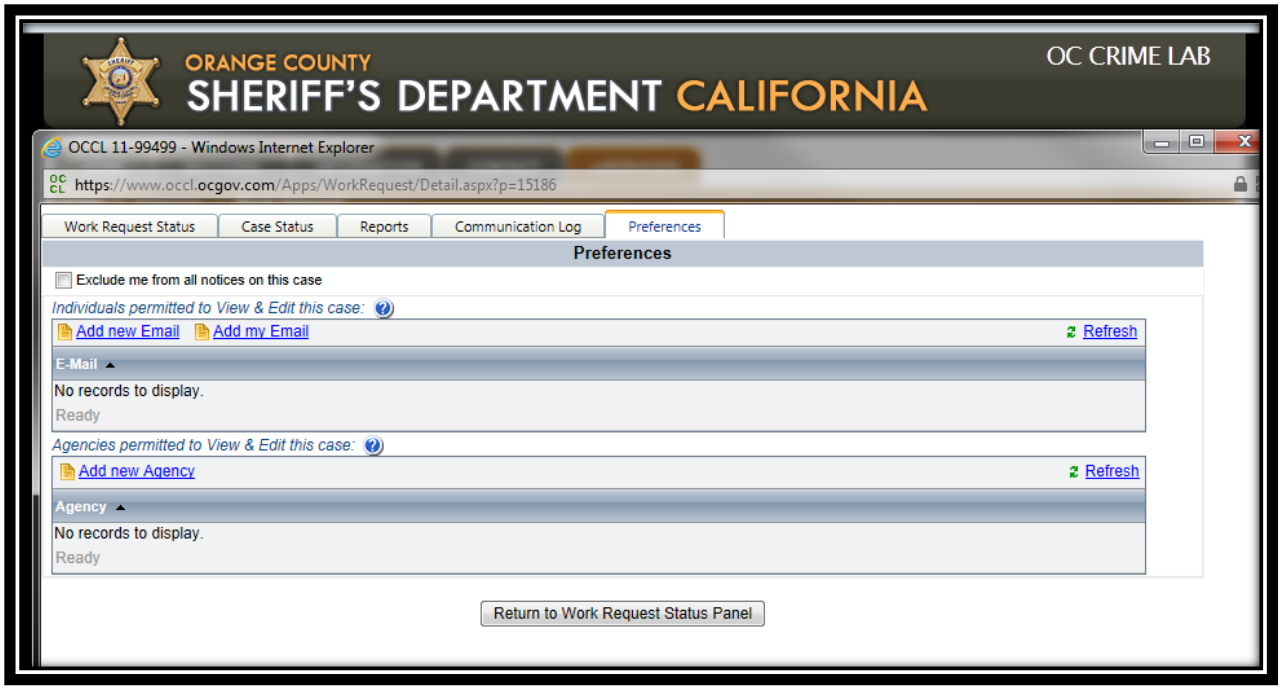
Communication Log



The communication log is used by lab staff, investigators, and deputy DAs to ask questions and share information about a case or an evidence item. An audit trail is formed and stays with the case in WRCS. Additional people can be added to the e-mail notifications by using the "Preferences" tab.



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Attachment C:

Property Crime Work Flow

Agency Enters Case Information into WRCS

DA Case Triage

Review Case Information from Agency + ensure proper elims. were collected

If case is not Prosecutable, Reject Case

Accept Case

OCCL Accepts Case & Evidence in WRCS

Case Information and Evidence Imported to LIMS

Evidence is Requested from Agency

Agency Delivers Evidence to OCCL

Case Assigned To DNA Analysts for Exam

Swab Item or Excise Swabs: DNA Manager

If Elimination Standards Are Needed

Extraction: Tecan EVO (evidence) or Qiagen EZ1 (ref)

QPCR Universal BioRobot

Amplify Universal BioRobot

PCR

CE Setup on QIAgility

G.A. 3130

GMID

Interpret Data

RTA Evidence

Agency Picks up Evidence

Profile to CODIS if Suitable

Report of DNA Typing

Technical Review of Report

Administrative Review of Report

Report to Clerical for Release

Insufficient DNA for Typing: Report

Technical Review

Administrative Review

RTA Evidence

Agency Picks up Evidence

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