CRIME MAPPING CASE STUDIES

VOLUME 2

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Crime Mapping Case Studies

Volume 2

Crime Mapping Case Studies: Successes in the Field

Volume 2

Edited by

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Printed in the United States of America

Library of Congress Number 99-75129

ISBN 1-878734-71-1

Cover by Marnie Deacon Kenney

Contents

Aiding Apprehension and Prosecution Efforts

Improving Law Enforcement and Criminal Justice Operations

Preface

Analysis and measurement are important issues for criminal justice practitioners today. "Data-driven decision-making" has become a catch phrase to define the intelligent use of information and statistics to guide policy and practice. Only a few decades ago, the primary data collection efforts in policing were used to assess average response time and submit aggregate statistics to the Uniform Crime Report; today's measurements are virtually real-time analyses of criminal events as they occur. It is no wonder that agencies are increasingly investing in Geographic Information Systems (GIS) as one of their primary analytical tools.

The purpose of this book is to disseminate examples representing "best practices" of GIS use in criminal justice. Submissions were carefully screened for both quality of presentation and merit; successful submissions demonstrated a measurable impact on criminal justice outcomes or practices. These case studies were included because they demonstrated how GIS can aid crime control and prevention efforts, support investigations and prosecutions of offenders, or improve the efficiency of criminal justice processes.

This book represents the second volume in a series devoted to examining and showcasing the use of GIS in criminal justice research and practice. The following chapters represent some of the best and most creative GIS applications for criminal justice to date. From creating maps that assess the impact of a drug crackdown to selecting sites for street Closed-Circuit Televisions (CCTVs), GIS is demonstrated as a valuable analytic tool. This volume also provides examples of how GIS can be used to predict the likely time and location of a serial offender's next crime, determine the optimal locations for checkpoints in construction site theft and direct police resources to achieve the greatest possible impact on gun violence.

We hope readers of this book will find it to be a valuable resource in exploring how they might use GIS to support their efforts and initiatives. In closing, we would like to thank Chuck Wexler, Executive Director of the Police Executive Research Forum, and Jeremy Travis, Director of the National Institute of Justice, for their support of this publication. We also

thank those who contributed to the development and production of this book. Martha Plotkin, director of communications at the Police Executive Research Forum, offered guidance and support on the content of this volume. She and Eugenia Gratto Gravely oversaw the production of this publication, which helped ensure its timely release. Elliot Grant designed the book layout and applied his strong editing skills to its text. Marnie Deacon Kenney created the book cover.

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Director
Crime Mapping Research Center
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Foreword

In 1998, PERF and NIJ recognized the need for a volume illustrating examples of successful crime mapping applications in the field. At the time, the use of Geographic Information Systems (GIS) had gained significantly in popularity, but no published resource was available for those agencies interested in learning more about this analytic tool and the various ways it can support successful crime control and prevention strategies. The resulting publication, *Crime Mapping Case Studies: Successes in the Field,* became the first edited volume to demonstrate how departments of varying sizes had taken crime mapping and applied it to specific situations ranging from community-policing initiatives to more effective criminal apprehension.

Although each year we strive to collect some of the most sophisticated and advanced examples of crime mapping, these projects are nevertheless easily replicable by readers of this volume. Our intention is to showcase some of the best work in the field while inspiring others to invest in this technology and experiment with new applications that can have a significant impact on criminal justice policy and practice. As departments share their successful projects, others will identify ways they can use crime-mapping technology to improve their effectiveness in both day-to-day operations and strategic planning efforts.

We recommend this book to police officers, analysts and other criminal justice practitioners interested in understanding and learning more about the power of computerized crime mapping. It is also a wonderful resource for anyone—police practitioner, community member or government official—seeking innovative ways to improve prevention and enforcement efforts and ultimately make our communities safer places to live.

Chuck Wexler
Executive Director
Police Executive Research Forum

Jeremy Travis
Director
National Institute of Justice

Supporting Crime Control and Community-Policing Initiatives

2

Reducing Campus Crime Through High-Definition Mapping

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Temple University

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Crime and victimization on college campuses have received increased attention in recent years. Realizing that campus crime and perceptions of safety have a significant impact on their institutions, college officials are changing the ways in which they deal with campus crime. Campus police departments are responding to growing demands for safety by experimenting with technical advancements in policing tools. The Temple University Department of Campus Safety Services' (DCSS) implementation of a high-definition Geographic Information System (GIS) provides one such example.

DCSS

Temple University's DCSS consists of the Campus Police Division and the Security Division. Together, these divisions serve Temple University's four campuses and 38,159 students and employees. The Campus Police Division consists of 123 campus police officers, each of whom is a Pennsylvania-certified law enforcement officer possessing the same authority as a municipal police officer. The Security Division consists of 90 security officers, who provide security in and around campus buildings, and Temple University students, who provide security at all building entrances.

The Temple University police have adopted sophisticated and technologically advanced policing methods in their daily routine. For years, environmental criminologists have emphasized the impact of the environment on crime and victimization. In response, DCSS has focused much of its efforts on situational crime control and prevention. These efforts, coupled with the university's commitment (and allocation of resources) to situational crime prevention measures, have had a dramatic effect on reducing victimization on campus.

HIGH-DEFINITION GIS

4

Traditional GIS has enabled crime analysts to examine crime patterns over large areas. In a typical GIS map, streets are depicted as lines and the built environment is ignored. While this large-scale GIS has proven effective for city- or countywide analysis of crime patterns, it is not as helpful when examining crime in small areas. Recognizing the inherent limitations in the traditional use of GIS, DCSS and the Temple University Departments of Criminal Justice and Geography and Urban Studies sought to develop a GIS that would be helpful for crime analysis in a small area—such as a college campus.

In 1997, the National Institute of Justice funded a project to improve policing on the Temple University campus. DCSS and the university academic team developed a high-definition GIS to examine official recorded police data and victimization data and better understand where and why campus crime occurs.

Using a combination of ESRI's PC ARC/INFO and ArcView software packages, a GIS technician and crime analysts developed a high-definition GIS for Temple University's campus and the two-block surrounding area. The GIS originated as AutoCAD drawings of the campus provided by the campus Facilities Management Department. Since these drawings are extremely detailed, unneeded features (such as water pipes and electrical wiring) were eliminated. The map was then altered so that all polygons were closed and lines were continuous. Aerial photographs of the area provided information about the surrounding blocks. Using PC ARC/INFO, the two-block extension was drawn and added to the campus map, and the entire map was digitized. (A three-dimensional aspect was also added to the map, but since this discussion focuses on outside crime, that portion of the project will not be described here.)

The high-definition GIS provides specific representations of the environment. Streets are depicted as lines, with lines on either side representing sidewalks. Buildings take the form of polygons, as do parking lots, lawns and athletic fields. Separate coverages are created for shrubbery, fences, lighting and other physical features, allowing the analyst to determine the level of detail suitable for the analysis. This level of detail in the GIS lets officers observe crime patterns in small areas. Unlike traditional GIS, the high-definition GIS plots incidents *exactly* where they occur. Whether an incident is plotted on the left side of a street, on the south side of a lawn, on the right side of a sidewalk or behind trees in an alley, the analyst can more accurately observe where an incident occurred and the details of the surrounding environment.

Assaults on Campus

Official police data indicated that four outside[1] assaults occurred on the Temple University campus during the 1997–98 school year. To obtain information about unreported crime, 2,000 students, faculty and staff were surveyed about their victimization experiences. Respondents to the Spring 1998 victimization survey reported 57 outside assaults occurring from May 1997 through April 1998. While incidents were scattered throughout the campus, the majority of assaults took place in one of four clusters (see Figure 1).

The northernmost cluster (ellipse 1) is located along Broad Street on the northwest boundary of campus. This area contains fraternity and sorority houses to the west of Broad Street and resident halls to the east. Just north of the housing is a liquor store that creates nighttime traffic along the corridor. Ellipse 2 indicates a cluster of assaults occurring in the center of campus. These assaults took place at the corner of 13th Street and Berks Mall. Classroom buildings and the library surround this intersection. The far east of the campus contains a third cluster of assaults. These assaults are located along Berks Street—the path from campus to the commuter train station. Finally, the fourth cluster of assaults took place on the southern border of campus, at Cecil B. Moore Avenue and Broad Street. The underground subway station is located at this intersection.

Police Action

Temple University campus police have been mapping crime patterns for several years. While the GIS was being developed, officers plotted reported crimes on a daily basis—first by hand, and then with the system. As the GIS advanced, daily maps became easier to create and included more environmental detail. Officers had access to maps as soon as they came on duty as well as throughout their shift. As a result, they were more aware of reported crime patterns and implemented some measures even before obtaining victimization information. Once police were able to map unreported crime, they could target specific areas. These maps help officers determine the best use of their time during patrols and assist DCSS officials in locating problem areas over time. Once these areas were identified using the

[1] "Outside" assaults occur on university paths, lawns, streets, sidewalks, etc., as opposed to inside campus buildings.

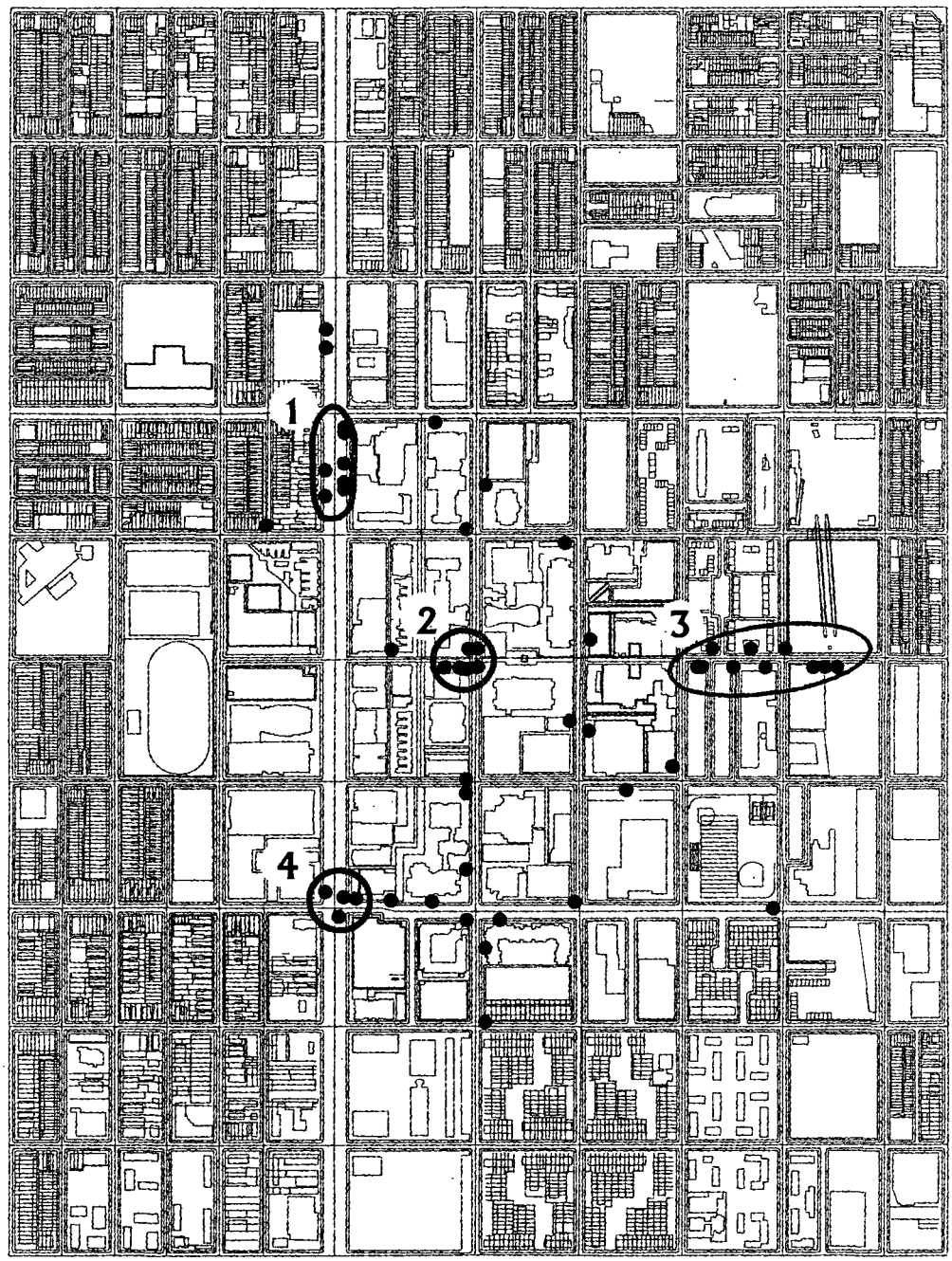

Figure 1
Temple University Police Department Assaults, 1997–98

high-definition GIS, several situational crime control and prevention measures were implemented:

- ***Security Kiosks.*** Temple University has three police kiosks. The first, located at the train station, has been staffed since the end of 1995 (see Figure 2, K1). The second, located at the corner of 11th Street and Berks Street, was built earlier but has not been consistently staffed. Based on the crime pattern along Berks Street that was revealed on the map, this kiosk has been consistently staffed from 7 A.M. to 2 A.M. since Summer 1998 (see Figure 2, K2). The third kiosk was built at 15th Street and Montgomery Avenue. It has been staffed since January 1999 (see Figure 2, K3).
- ***Lighting.*** With increasing emphasis on the environment and its impact on crime, the university began construction of high-powered lighting throughout the campus during Summer 1998. The lighting, located on building rooftops, became operational in the beginning of the 1998 fall semester. While illuminating most of the campus, the lighting targets the specific crime hot spot locations. Lighting focuses on Broad Street at both the north and south ends of campus (see Figure 2, L1), Berks Street from 12th Street to the train station (see Figure 2, L2) and 13th Street for the length of campus (see Figure 2, L3). The lighting is similar to stadium lighting in that it effectively lights the campus at night, allowing "daytime-like" viewing and eliminating dark pathways.
- ***Escort Service.*** As a result of maps displaying crime patterns along paths to public transportation stations and parking facilities, Temple University police increased the escort services provided on campus. During the 1997–98 school year, two vans provided shuttle services around campus from 4 P.M. to 7 A.M. These vans, coupled with student and police pedestrian efforts, provided approximately 33,000 escorts that year. Escort services were increased the following year with the addition of two vans to the shuttle route. Furthermore, police escort service was advertised in fliers and campus safety brochures. DCSS provided more than 64,000 escorts throughout the 1998–99 school year, minimizing the number of people walking alone to the train and subway stations.
- ***Increased Patrol.*** Temple University also increased the Campus Police Division's bike patrol unit from nine to 19 officers in August 1998. As a result, two new patrols were established in the locations showing the most crime. The first is located in

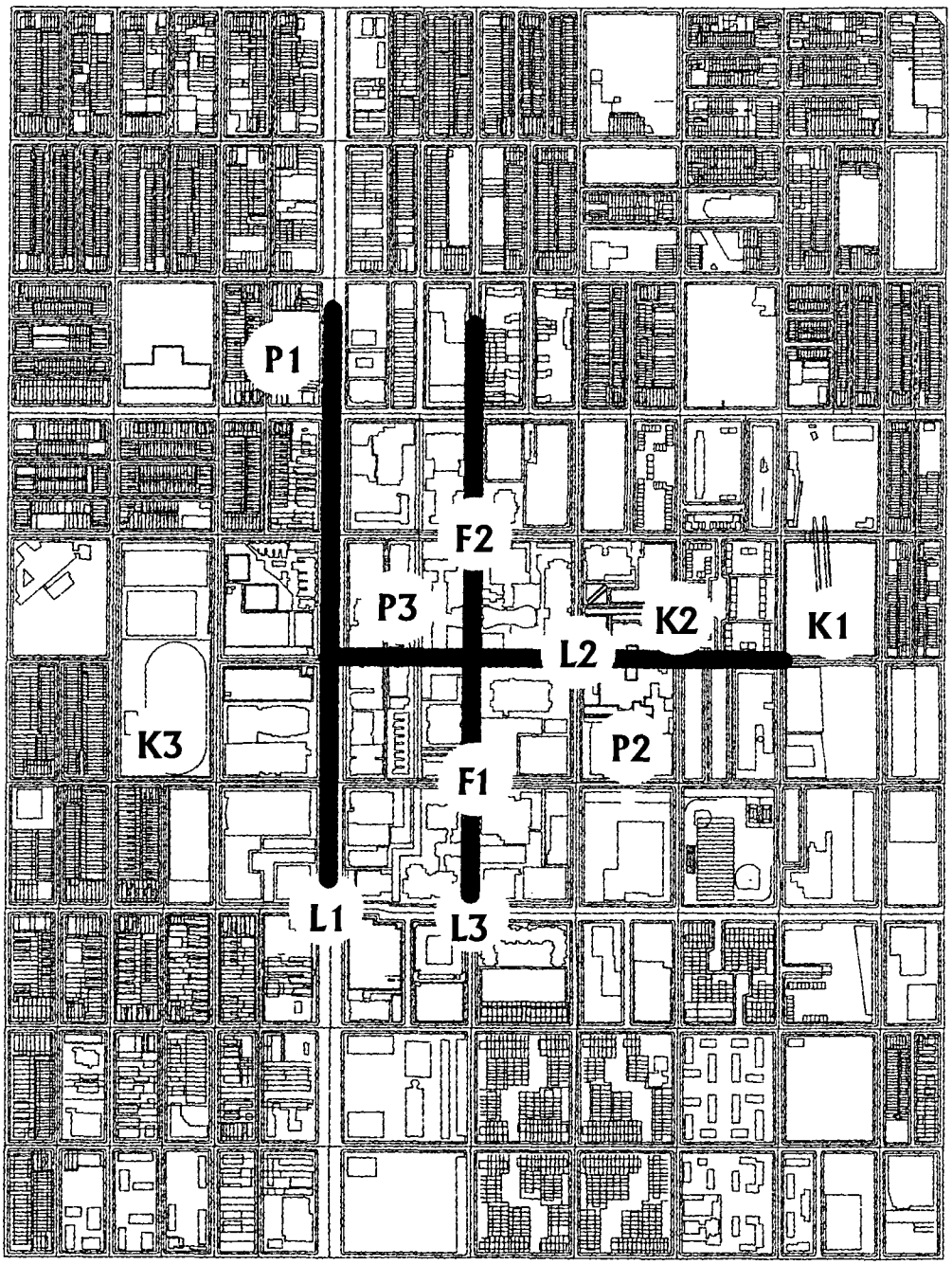

Figure 2
Temple University

the northwest block of Broad Street (see Figure 2, P1). The patrol provides police presence and guardianship on the path from campus to the local beer distributor. This is a daily patrol from 7 A.M. to 2 A.M. The second is a 24-hour patrol located at a gas station. This patrol was established because of problems relating to persistent panhandlers in the area. Besides allowing two new patrols, the additional bike patrol officers increase police visibility. Campus police work out of two locations—the main police department (see Figure 2, P2) and the center station (see Figure 2, P3). The bike patrol was located out of the center station until Summer 1999,[2] increasing officer presence in the center of campus during the 1998–99 academic year.

- ***Other Impacts.*** In addition to the crime prevention and control measures, other factors have affected the amount of campus crime. The first of these is the new construction on the campus. In Fall 1998, new construction began on 13th Street, closing the street to all through traffic. While students can still walk through the area, the street is torn and offers a rough and dirty walkway. As a result, most students have avoided the area. Access is limited, and no cars can pass through. The corridor is fenced at 13th Street from Montgomery Avenue to Norris Street (see Figure 2, F1 and F2).

The annual Spring Fling festival has also changed. During the 1997–98 school year, Spring Fling was a large festival, with a concert and beautiful weather. Thousands of students participated, becoming rowdy, and several incidents of assault occurred. Spring Fling 1998 was a much smaller event. The festival did not include a concert, and the weather was cold and rainy. Fewer students participated in the festival, and the campus had no reported crimes.

Finally, two fraternity houses located along the northwest border of campus were put on social probation for the 1998–99 academic year. After violating numerous university regulations, the fraternities were forbidden from hosting any parties. The year of probation led to a decrease in the amount of drinking and traffic along Broad Street to and from fraternity houses.

[2] Construction during Summer and Fall 1999 has prevented the bike patrol from accessing the center station. Temporarily, the patrol will work out of the main police station.

Conclusion

The following year, the second phase of the survey was administered. Slightly fewer than 1,850 students, faculty and staff were surveyed. The number of assaults reported in the second victimization survey decreased significantly. Respondents reported only 16 outside assaults during the 1998–99 academic year. As illustrated in Figure 3, none of the four clusters found in the first survey reappeared.

The ability to examine crime patterns and the environmental features surrounding them has enabled Temple University to change both police practices and the environment in which the police patrol. DCSS has allocated its efforts to specific problem areas, resulting in more efficient policing. While this study has focused on assaults, the campus also experienced a decrease in the number of victimizations reported for numerous other categories of crime.

Furthermore, the implementation of the high-definition GIS has allowed university police to recognize crime patterns almost immediately. DCSS is currently implementing a system by which all officers will have access to interactive maps through the use of laptop computers. Communication among officers will continue to improve in both speed and accuracy, adding to their crime control and prevention capabilities.

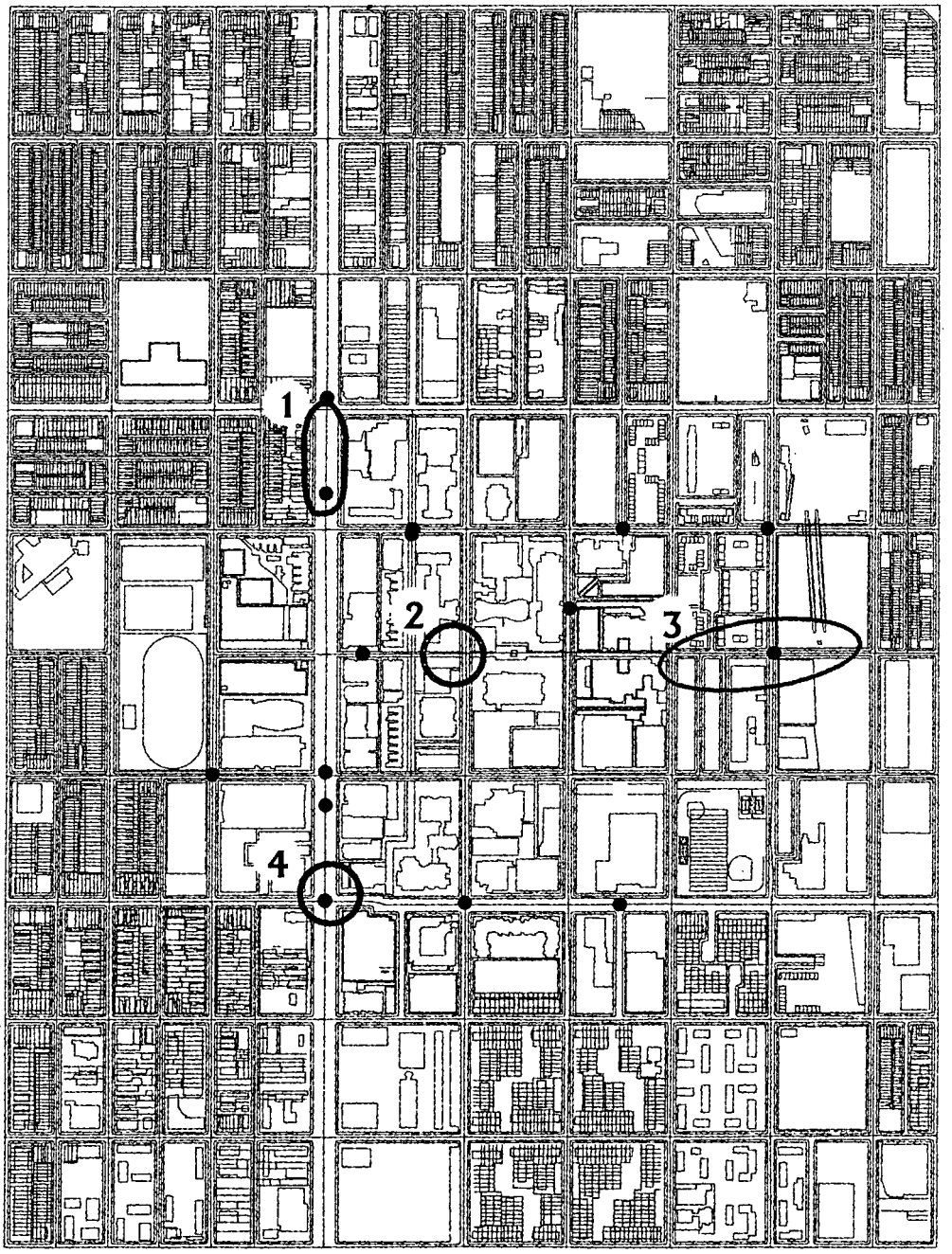

Figure 3
Temple University Police Department Assaults, 1998–99

About the Authors

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Lt. Robert Lowell is chief of the Investigations Unit in the Temple University Police Department, where he supervises all criminal investigations, surveillance details and dignitary protection details. He also performs crime analysis and crime mapping and is the department accreditation manager. Lt. Lowell has been with the Temple University Police Department since 1981. Prior to working with Temple University, Lt. Lowell served for 11 years in the Philadelphia Police Department.

Analyzing Gun Violence

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Illinois State Police

Ralph Caldwell Jr.
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BACKGROUND

In early 1998, the Springfield Police Department (SPD) and the Illinois State Police (ISP) partnered to analyze crime and develop strategic patrol and investigative plans. The first analytic initiative was to collect and analyze information on gun-related incidents and gang-related shootings within the city of Springfield, Illinois. Recent indictments of the top tier of gang leaders had resulted in a power struggle and turf wars as rival gang members sought to take control. As a result, the number of shootings and gun-related activity had been escalating in the city. Analysts from SPD and ISP's Crime Trends and Research Team worked together on a series of analyses to define the problem more accurately. ISP provided expertise in GIS analysis and statistical techniques, and SPD provided input into the history of tactical operations and street-level enforcement. The result was a comprehensive report of statistical and spatial analyses of gun-related incidents in Springfield. The report was disseminated to department administrative staff and each beat lieutenant to provide to patrol officers.

ANALYSIS

Two-and-one-half years of gun-related incident data (police reports from SPD's records room reflecting gun-related incidents, shootings and stolen and recovered weapons) were collected and entered into a database for analysis. U.S. Census data from 1997 and projections for 2002 were also entered to assess socioeconomic characteristics across the city.

The report consists of three sections. Part I is a statistical overview of the data, including yearly and monthly trends (see Figure 1); percentages by reporting beat; and thresholds[1] for gun-related incidents, gang-related

[1] Thresholds determine the range of activity considered "normal" in an area for one month, as defined by the mean number of events. The threshold spans plus and minus one standard deviation from the mean. Points outside the threshold show significant increases or decreases.

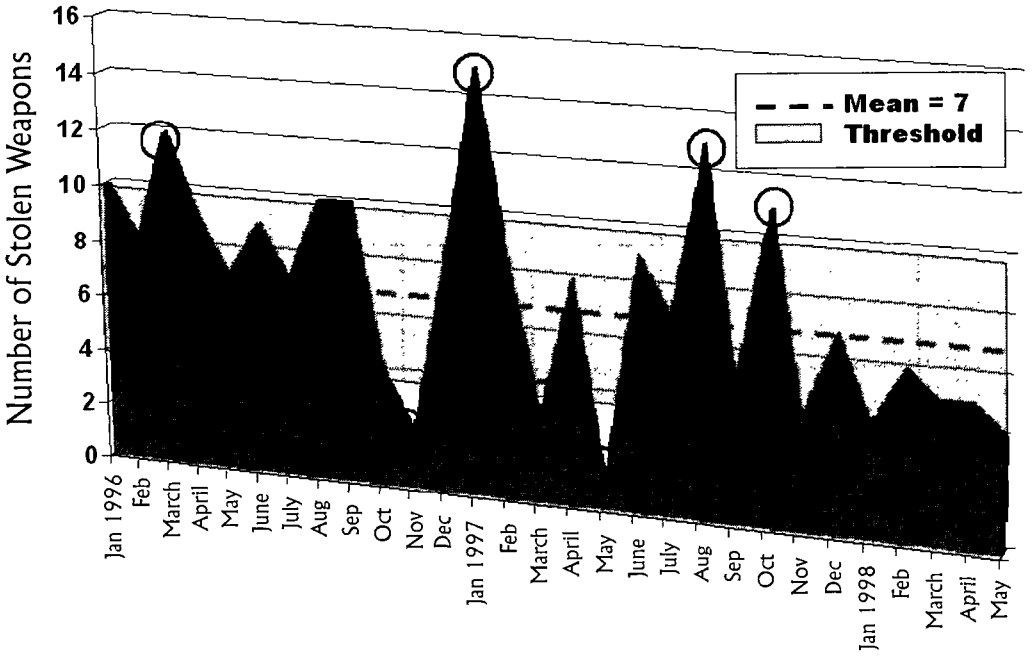

Figure 1
Stolen Weapon Reports: Monthly Trends

gun incidents, confirmed shootings and stolen and recovered weapons. An analysis of the density maps is also included in Part I.

Part II consists of a geographic analysis of the data using ArcView 3.1 and ArcView Spatial Analyst. Incident addresses were geocoded, producing three maps of the location of each particular type of incident for 1996, 1997 and 1998. Density calculations were performed to determine "hot spot" areas for each year of activity. All three years of data were represented in map layouts depicting a different type of gun incident (i.e., the first map shows "hot spot" areas for all three years of stolen weapon incidents, the next map layout illustrates recovered weapons, etc.). Yearly comparisons illustrate the movement of the center of activity and help determine changes in density patterns of gun-related incidents in the city. This format was developed to let readers quickly scan the density movement of each type of gun-related incident over time. Graduated symbols depict multiple incidents occurring at the same address. Also included is a citywide map combining the three years of all types of gun-related incidents to provide a visual overview of the activity for the time period under study.

Part III of the report uses ArcView Spatial Analyst along with demographic information obtained from Claritas 1997 Real Estate Solution Series CD. Census tracts in Springfield were identified, and several grid layers were produced of demographic characteristics that prior research has recognized as being correlated with crime. The layers include

- Population density, 1997 and 2002 projected
- Per capita income, 1997 and 2002 projected
- Household income below $20,000, 1997 and 2002 projected
- Youth population ages 18 to 24, 1997
- Persons 24 and older without a high school diploma, 1997
- Percent change in the number of families from 1997 to 2002

Each grid was reclassified using natural breaks with 10 classes. A map calculation was produced using the data described above. Map calculations were standardized by dividing by the number of layers, then reclassified into nine classes. Figure 2 depicts three categories of classes—low (score 1 to 3), medium (score 4 to 6) and high (score 7 to 9)—with darkest areas having the highest crime risk and lightest areas having the lowest crime risk.

Combined with the crime risk layer are all gun-related incidents from 1996 through 1998, as well as shootings through May 1999. Viewing the layers together substantiates that the clustering of crime appears in and around the highest crime risk areas. The projected 2002 crime risk map indicates an even closer spatial relationship between incidents and areas of high risk. Based on the "broken window" theory, the map illustrations are useful in predicting future problem areas for strategic patrol and crime prevention efforts.

RESULTS

Geographic analysis of the gun data and shooting locations identified the emergence of gang violence in an area inhabited by a recently relocated gang from Peoria, Illinois. This gang faction moved into the area immediately following the SPD's indictments of top-tier gang leaders. As a direct result of this analysis, SPD command was able to make informed decisions regarding deployment of patrol and investigative personnel. Directed patrols and a heightened awareness of the locations and times these incidents were likely to occur had a positive impact on the field. Continuing with these analyses has enabled SPD to anticipate changes in trends in violent crime and gang activity.

Six months following the original report, SPD command staff has submitted a request for an update. The update is currently in production, and new techniques will extend the analysis beyond its current boundaries.

From the time the "Guns in Springfield" analysis was submitted to SPD personnel in December 1998, gun violence in the city has dropped significantly. Beat supervisors placed directed patrols in the beats suffering the most gun-related violence. The analysis made all officers more aware of the problem, and some took it upon themselves to provide an increased police presence in affected areas. A summer strike force was also placed in the affected area.

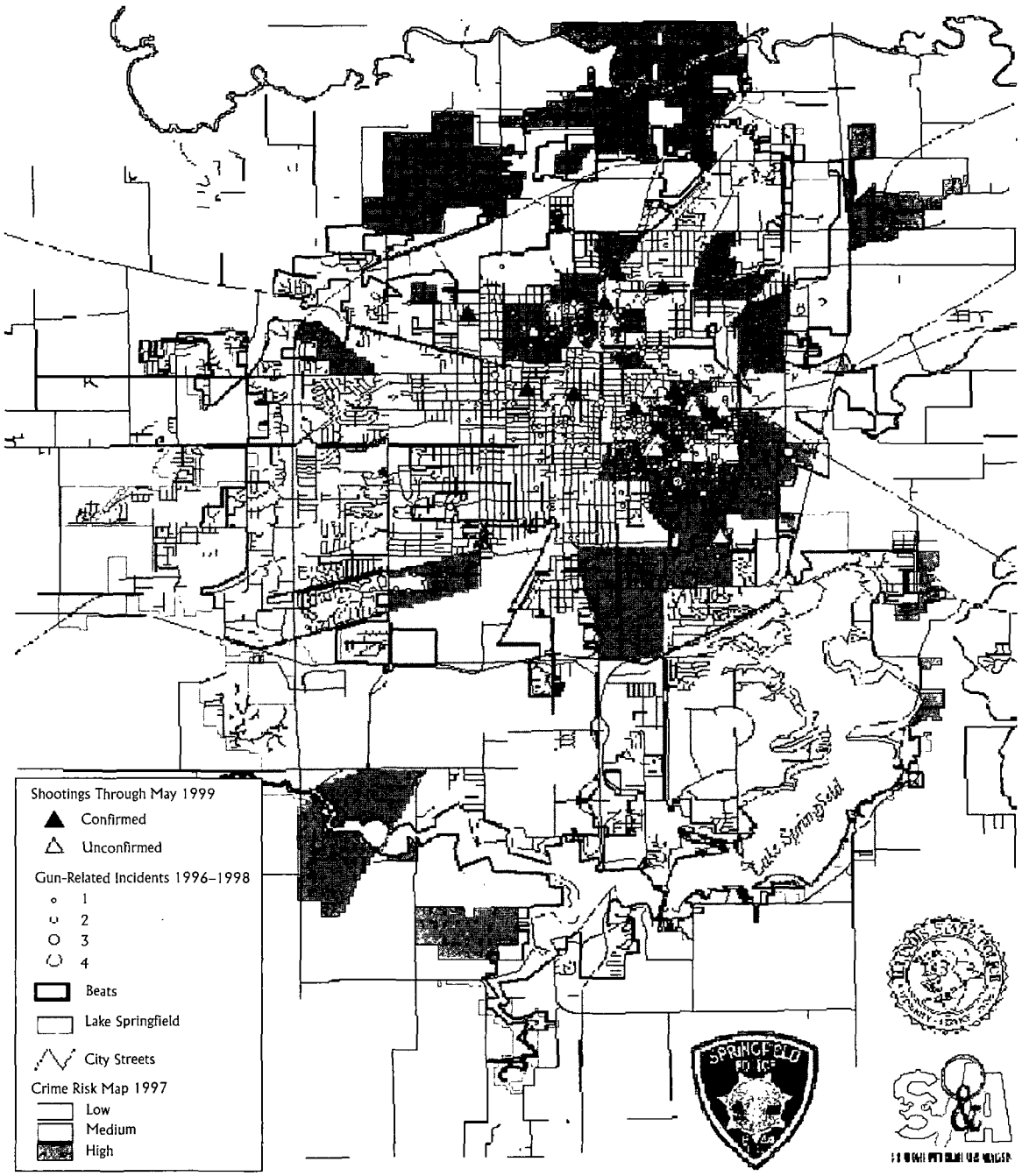

Figure 2
Crime Risk Map 1997 Census with Gun-Related Incidents 1996–98 and Shootings 1999 YTD

For the first quarter of 1999, the number of gun violence reports decreased 75 percent. For the same period last year, January gun incidents were down 94 percent, February down 81 percent and March down 62 percent. While these types of incidents are cyclical in nature (and quarterly fluctuations historically occur), the overall trend forecasts a 30.4 percent decrease in the total number of gun violence reports by the end of the year.

CONCLUSION

The Springfield Gun Analysis project has proved to be useful in other areas as well. Besides providing an excellent example of the breadth and quality of both departments' analytic work, it has served as a springboard for additional analysis projects. Also, the Assistant U.S. Attorney in the Central District of Illinois (who originally requested ISP to study gun-violence trends in the area) is gathering this information to formulate strategies for preventing gun violence. Such efforts exemplify the value of spatial analysis in identifying patterns of gun violence, anticipating future trends and developing effective law enforcement responses.

ABOUT THE AUTHORS

Lex Bitner serves as leader of the Strategic Information and Analysis Group for the Division of Operations of the Illinois State Police. Bitner has been with the department for 12 years. She conceived and cultivated the mapping unit in 1995, which has grown to encompass all intelligence functions within the department. Bitner has a bachelor's degree in Criminal Justice from the University of Illinois.

Jenni Gardner serves as leader of the Crime Trends and Research Team, which deals with general crime issues and trends for ISP's Strategic Information and Analysis Group. Gardner started her career with the department in the computer graphics department and brings to the team an artistic perception of cartography. She has served nine years with the department and has been crime mapping since 1996.

Ralph Caldwell Jr. is the commander in charge of the Administrative Services Division of the Springfield Police Department. He is responsible for the Training Academy, the Records Section, the Personnel Section, the Fiscal Section and the Computer Unit. Caldwell has been with the department for more than 19 years.

Evaluating the Impact of a Drug Crackdown[1]

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and The University of Maryland

BACKGROUND

One of the primary benefits of crime mapping is its use as an assessment tool to identify changes in crime trends following an intervention. Yet generating a map of a large set of data over an extended period of time tends to result in a concentration of points appearing as a single cloud of crime. Moreover, a conventional pin map depicting crime events inevitably draws equal attention to places with one event and places with hundreds. A cluttered map of points, which may or may not represent multiple events, obviously does not lend itself well to crime analysis. To realize the potential benefits of maps fully, data must be aggregated efficiently using an effective theory, so that clutter and meaningless points do not cause the map to lose its significance.

In the Evaluation Unit of the Washington/Baltimore High Intensity Drug Trafficking Area (W/B HIDTA), analysts strive to achieve clarity through the use of Repeat Address Mapping (RAM), where the fewest number of points are used to convey the most information. The following is a discussion about this unique process and how it was used in a law enforcement operation in Prince George's County, Maryland.

OPERATION CLEAN

The W/B HIDTA often acts as an intermediary between local law enforcement and federal agencies on specific projects. In such cases, the Evaluation Unit provides geographic analyses to assist in the selection of target areas and to assess changes in target areas following interventions. In 1996, one such project funded by the W/B HIDTA was an initiative called Operation CLEAN in Langley Park, Maryland, carried out by members of the Prince George's County Police Department and the Drug Enforcement Administration. The project aimed to disrupt drug market activity.

[1] The authors wish to acknowledge Dr. John E. Eck, University of Cincinnati, as one of the original creators of the Repeat Address Mapping technique.

ANALYSIS

After Operation CLEAN was complete, analysts at the W/B HIDTA analyzed drug calls-for-service, homicide and shooting data to determine its success. Drug calls-for-service data were used because they are good indicators of the public's perception of the drug problem (i.e., sources of disturbances) and because when they are mapped according to repeat drug call locations, areas representing frequent sources of disturbances become focal points of the maps. Homicide and shooting data were used to convey any changes in major violence as a result of the disruption of the drug markets. Therefore, drug calls-for-service data could be overlaid with crime data to determine if the drug markets were changing and if the changes in the markets were affecting crime trends in the area.

Since the Langley Park area had a high concentration of crime, it was difficult to derive concrete meaning from a conventional pin map of all data without a hot-spot analysis. As a result, evaluation analysts used the RAM technique, which was recently developed by the W/B HIDTA Evaluation Unit based on criminological theory and research. RAM involves mapping addresses with multiple crime events over a certain threshold (referred to as a minimum plotting density, or MPD). The threshold is determined by aggregating the data and then ranking the addresses by the number of corresponding events. The analysts then select the approximately 10 percent highest-ranked addresses, which usually account for 20 to 60 percent of all crime events. A map of MPDs will thus sift out all the addresses at which there are few or no repeat events, leaving places that account for much of the crime. RAM reduces clutter, thereby facilitating trend analysis. In addition, the threshold standard of RAM enhances the meaning of each point.

Using a RAM hot-spot analysis also helps improve law enforcement and crime prevention strategies. Since a small number of addresses usually accounts for a large number of crime events, intervening in those specific areas of high crime will presumably have a substantial impact on the overall amount of crime in a given area. Furthermore, since these crime hot spots may be linked to incidents of surrounding crime, enforcement and prevention measures centered at high-crime locations may have a diffusion benefit—reducing crime in the surrounding areas.

Since these areas of high crime are so important in law enforcement strategy, reducing the MPD locations is key to a successful operation. To understand the benefits of using MPDs, it is necessary to explore how W/B HIDTA analysts first used a conventional analysis of the Langley Park operation and how that analysis was limited. Figure 1 depicts the target area and its surroundings during the six-month period prior to the crackdown,

which began in July 1996. From this map, we found that there were 642 drug calls-for-service, four homicides and four shootings in the area during the six-month period. If we were concerned solely with numbers, we could compare this map to a similar map exhibiting the same six-month period in 1997 (Figure 2) to see if the number of events decreased. In this means of comparison, it is evident that homicides decreased by 100 percent, shootings by 25 percent and drug calls-for-service by 62 percent. For our analysis, the most important number was the drug calls-for-service decrease because the numbers were so small for homicides and shootings that any changes could have been a product of random fluctuations and not the result of a successful operation. It is therefore necessary to note that drug calls-for-service dropped by 62 percent in Langley Park, while drug calls-for-service for the entire county decreased by only 24 percent.

This first level of analysis of raw numbers suggests that the operation had some impact in disrupting the drug market in the area. But this analysis was not a fully adequate measure of success since it ignored any changes in hot-spot areas. If, for instance, the overall numbers went down but activity in the hot-spot areas did not change, this would not signify a successful and efficient use of law enforcement resources. The use of this conventional analysis also made it difficult to incorporate a spatial component in our evaluation. In comparing Figures 1 and 2, for example, it was difficult to determine visually where the operation was effective because the points representing single events conceal possible reductions in repeat events. It was thus necessary to incorporate a RAM hot-spot analysis into our evaluation.

Using the RAM analysis, hot-spot areas were easier to isolate because all the points representing those addresses of lesser activity had been discarded. For this study, the threshold was set at four or more drug calls-for-service per address. At this threshold, determined from countywide data, four or more events accounted for 10 percent of all addresses and 40 percent of all events in the first half of 1996. Within Langley Park, the MPD addresses accounted for 8 percent of the addresses and 63 percent of the events, demonstrating that a depiction of only MPD data still showed a majority of events without the clutter of 92 percent of the addresses. Figure 3 shows the RAM analysis for drug calls-for-service, along with the homicide and shooting data before the operation.[2] From Figure 3, analysts were able to identify the major groupings of MPD points so that changes in these hot-spot areas could be identified by comparison to Figure 4, a depiction of MPDs after the operation.

[2] A RAM analysis of homicide and shooting data was not done because of the small amount of events and the infrequency that a homicide or shooting repeats at the same address in a six-month time period.

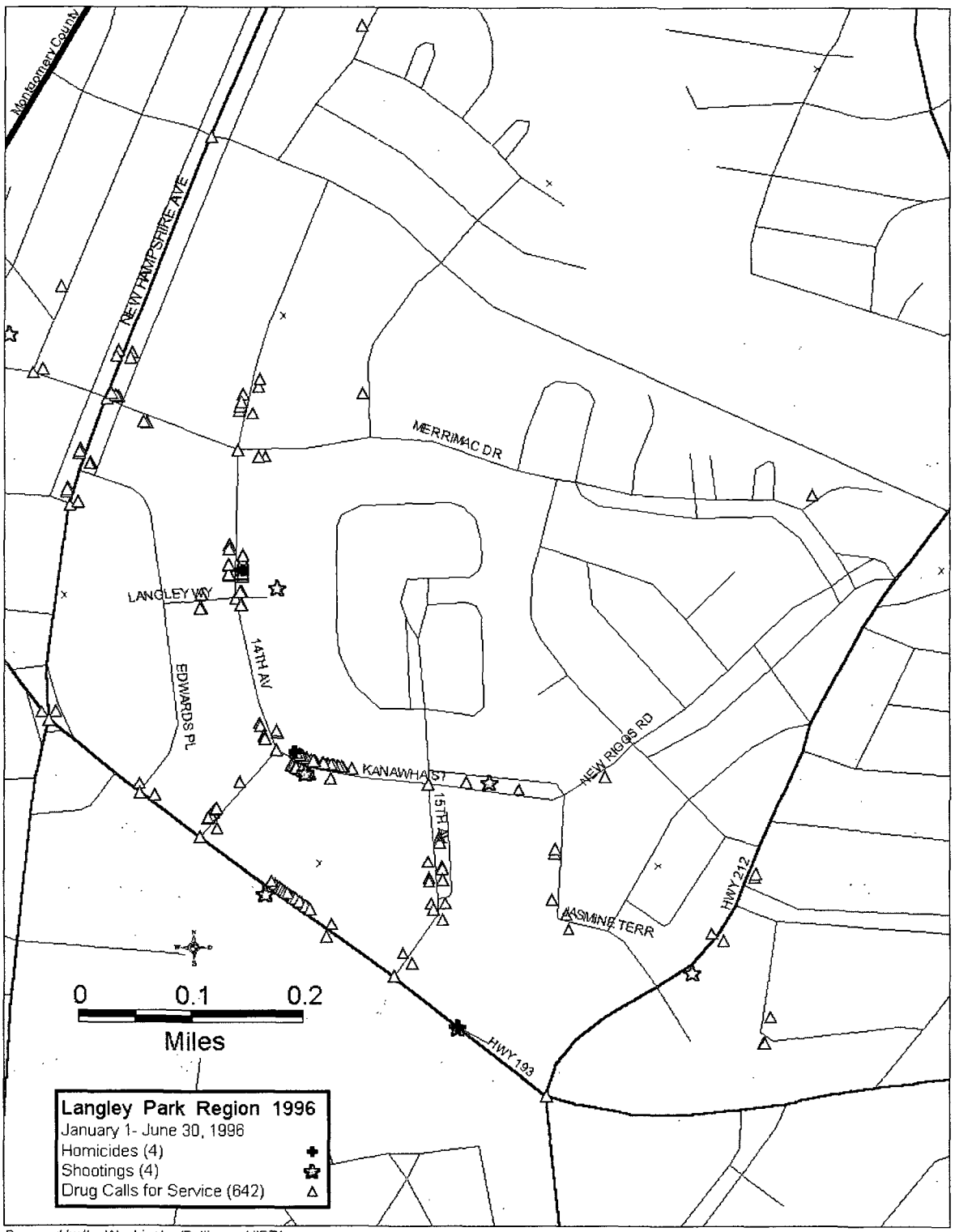

Figure 1
Conventional Analysis: Before Operation CLEAN

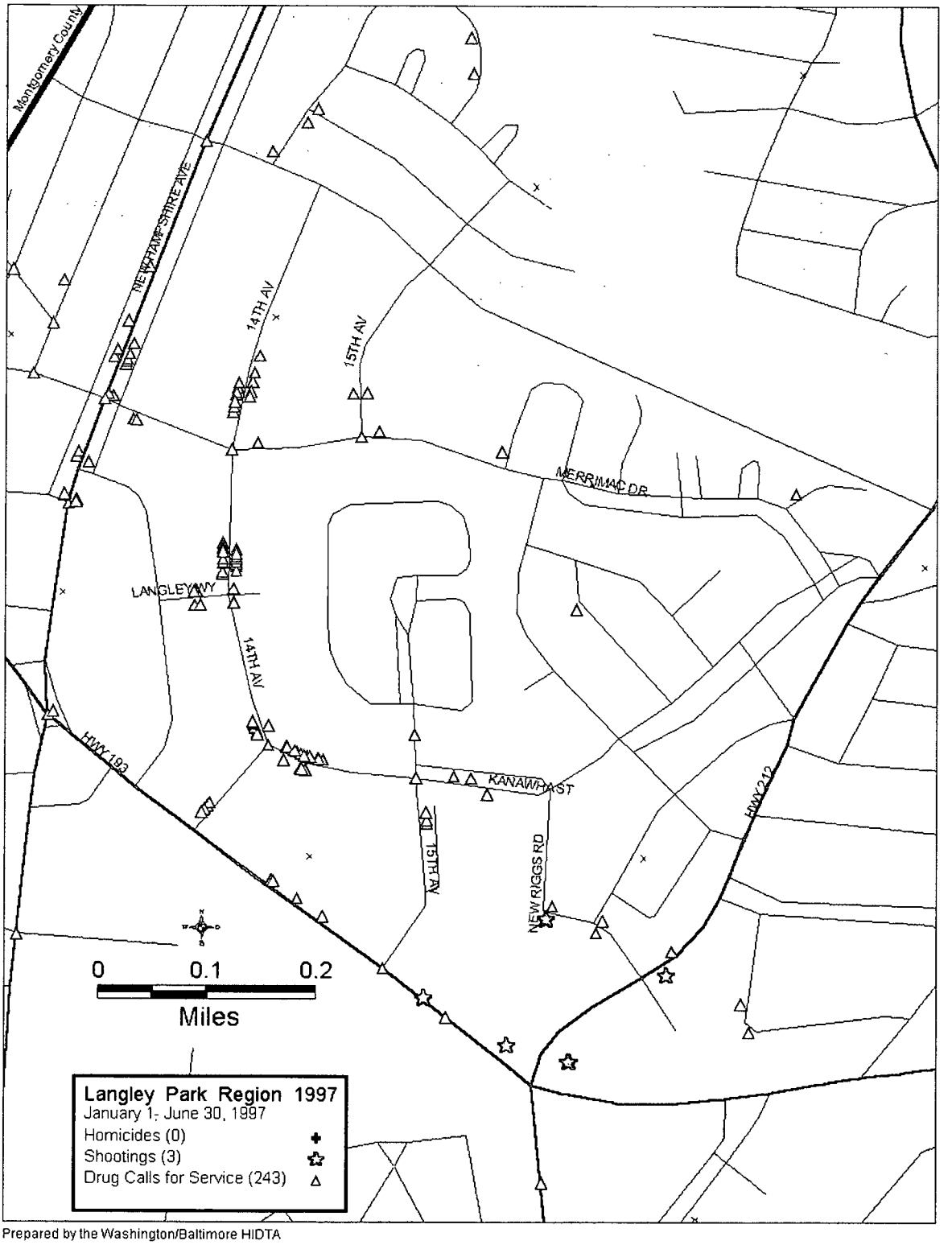

Figure 2
Conventional Analysis: After Operation CLEAN

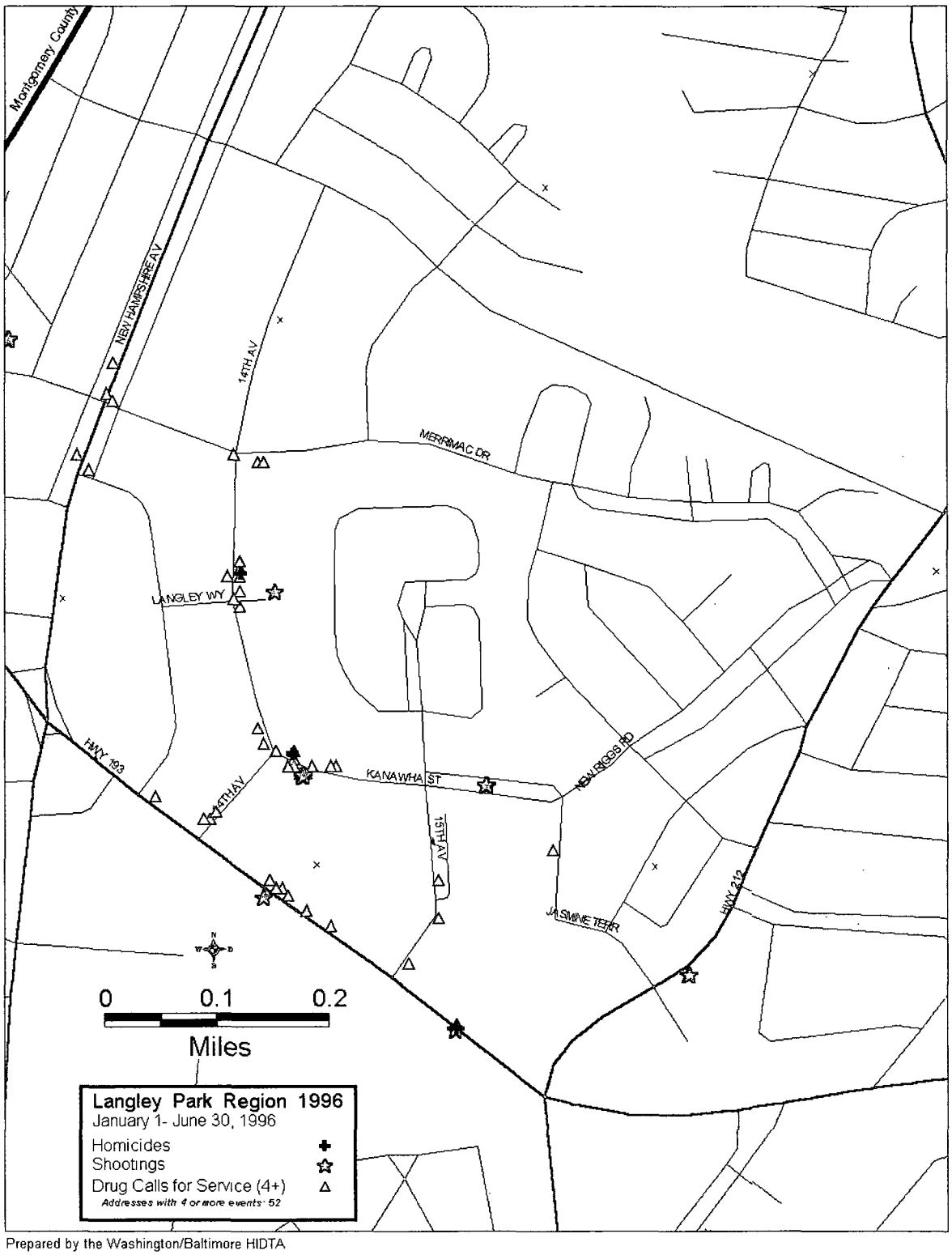

Figure 3
RAM Analysis: Before Operation CLEAN

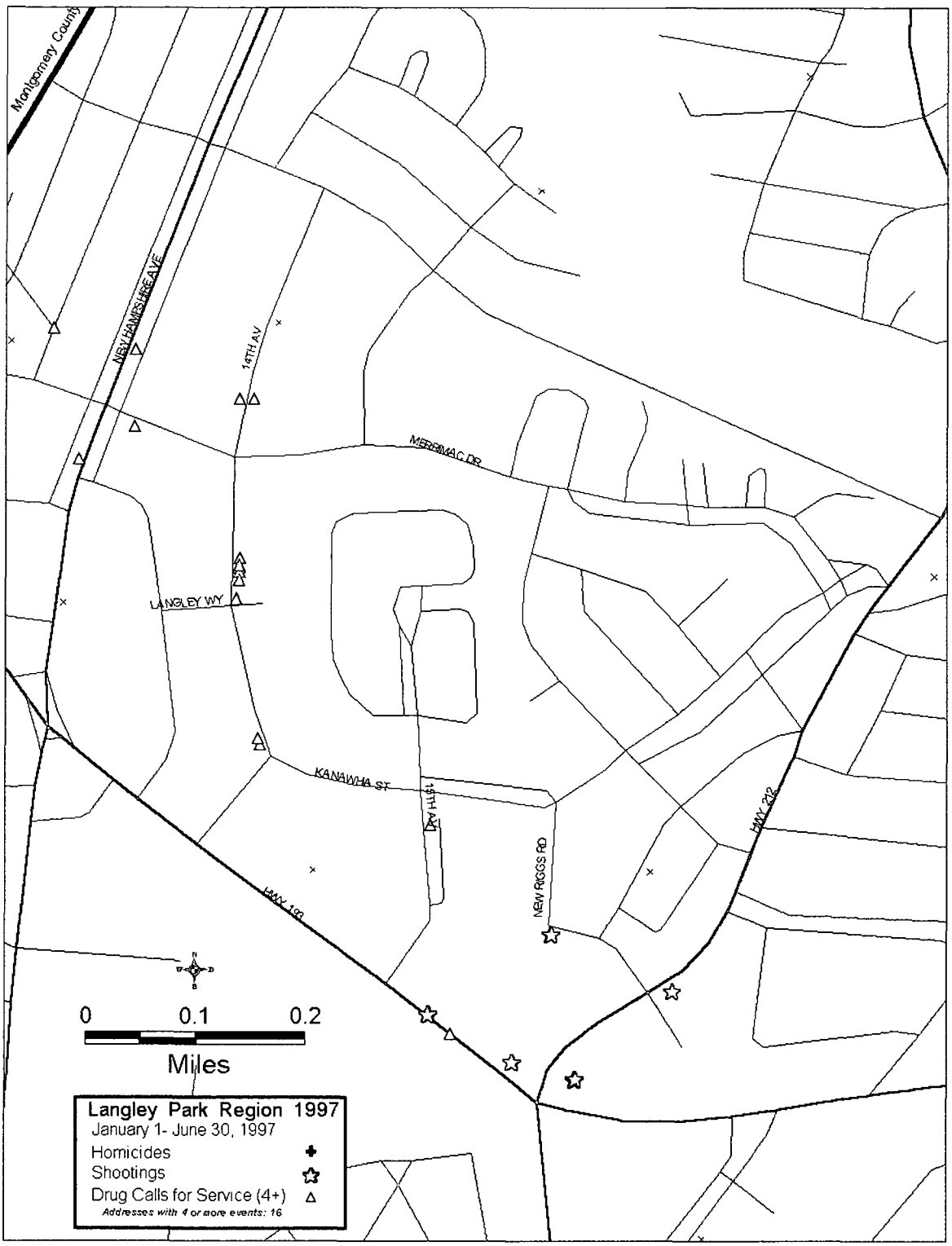

Figure 4
RAM Analysis: After Operation CLEAN

RESULTS

The MPDs supported the finding of the conventional analysis and provided additional useful information in evaluating the operation. As evident in comparing Figures 3 and 4, the number of addresses with four or more drug calls-for-service during the six-month period decreased by 69 percent after the operation. Not only did the number of MPD addresses decrease, but the average number of events per MPD address also decreased, from 7.81 to 5.56—suggesting a positive impact on the areas of highest crime. In analyzing specific areas, the large clusters of 1996 MPD addresses found at the intersection of Kanawha Street and 14th Avenue, along Merrimac Drive and along Highway 193 mostly disappeared with minimal displacement. The hot-spot area around the intersection of Langley Way and 14th Avenue still had a high concentration of MPD addresses, so analysts were able to use the MPD data to alert the appropriate law enforcement officials. The RAM analysis was thus useful in both indicating that the operation successfully interrupted the area drug market and informing appropriate personnel about any areas needing further monitoring.

It is important to note that the same trends in the reduction of hot-spot addresses could not have been detected using a conventional analysis. This is because some of the 1996 MPD addresses had a few calls in 1997 and therefore appeared in Figure 2 as a single point. Since it was difficult to tell if the number of calls in the hot-spot areas had changed at all, there was little evidence of any reduction in calls in those areas if one depended solely on Figures 1 and 2 for the comparative analysis. With the MPD analysis, however, one is able to see that there was a substantial reduction in drug calls-for-service in the most problematic areas.

CONCLUSION

This example of assessing the impact of Operation CLEAN demonstrates that the use of Repeat Address Mapping is an extremely effective evaluative tool. It is able to reveal trend changes for large data sets and locate hot-spot areas that require the most attention. RAM is simple to use in MapInfo and is easy for both analysts and law enforcement officials to understand. During the course of the W/B HIDTA analysts' work with many other law enforcement initiatives and operations, RAM has effectively been used to make maps more meaningful and better suited to support the allocation and assessment of law enforcement resources.

About the Authors

Jeffrey S. Gersh is the Law Enforcement Evaluation Coordinator for the Washington/Baltimore High Intensity Drug Trafficking Area. In addition to assessing the performance of local, state and federal drug enforcement groups, he supervises the W/B HIDTA's mapping and crime analysis unit. He is currently a doctoral student at the University of Maryland at College Park. Gersh received his master's in criminology from the University of Baltimore.

Kyle C. Beardsley is a crime analyst in the Evaluation Unit of the Washington/Baltimore High Intensity Drug Trafficking Area. He is responsible for aggregating, geocoding, mapping and analyzing crime and illicit drug activity data for participating federal, state and local agencies. Beardsley is currently an undergraduate at the University of Maryland at College Park, where he is pursuing bachelor's degrees in Economics and Political Science.

28

Reducing Construction Site Crime

Susan Wernicke
Overland Park, Kans., Police Department

BACKGROUND

In December 1997, detectives from the Overland Park, Kansas, Police Department's Property Crimes Unit noted a sharp increase in the number of residential construction site burglaries/thefts. In response, the detectives decided to revive the Heavy Construction Equipment Theft Task Force, a group of regional law enforcement agencies originally established in 1990 but recently inactive. All departments were requested to send a representative to a reorganizational meeting in early January 1998. Approximately 40 people attended the meeting, including representatives from Kansas City Power & Light, the Heavy Constructors Association of Greater Kansas City, various equipment dealers throughout the metropolitan area and the National Insurance Crime Bureau (NICB) Criminal Investigative Division.

Detective Denis Plumly, supported with crime statistics provided by the Crime Analysis Unit and the City's Permit Services office, outlined the problem for the task force. There were a total of 50 construction site burglary/theft incidents for 1997. The total number of residential construction permits issued in Overland Park for residential construction was 1,178, a significant increase since the previous year. The group concurred that the information Detective Plumly provided was valid not only for Overland Park, but also for most of the metropolitan agencies in the Kansas-Missouri bistate area.

ACTIONS

The task force decided to initiate a three-pronged approach to reduce construction site crimes: (1) get the word out to the public that there would be a crackdown on this type of crime, (2) work with builders and contractors on better ways of securing property and (3) identify known offenders who specialize in construction site thefts/burglaries or the theft of heavy construction equipment.

To accomplish the second goal, the task force decided to include both law enforcement and non–law enforcement representatives (construction site dealers and members of the Heavy Constructors Association of Greater Kansas City) in future monthly meetings. Though suspects' names would

be discussed by detectives, task force members recognized that the non–law enforcement representatives already knew the names of these suspects and often could provide additional information regarding their associates, places of current and previous employment, and other pertinent data. Members of these businesses and groups also provided names of suspects they believed to be involved in construction crimes not yet known to detectives.

The task force asked the Overland Park Crime Analysis Unit (CAU) for assistance in meeting the stated goals. In preparation for the next meeting, the CAU created a Microsoft FoxPro database of all construction equipment theft information from each participating metropolitan agency. The database included: (1) information regarding the theft of pieces of equipment, such as agency, date, time, location, color, year, make, model, Vehicle Identification Number (VIN), serial number, license, value, etc.; (2) information regarding the suspects or arrestees included in each report, such as name, race, sex, date of birth, address, known associates and method of operation; and (3) recovery information, including date, time, location, condition of property, etc. The CAU also prepared a map of Overland Park's 1997 residential construction site crimes. This map plainly showed that the majority of construction site crimes were occurring south of 127th Street and west of U.S. Highway 69—the southwest portion of the city (see Figure 1).

Armed with this information, Detective Plumly organized the next meeting for the first week in February. All those who attended the January meeting, plus representatives from about 10 additional agencies (including the Highway Patrol), attended. As suggested by the Overland Park crime analyst, the task force decided to institute a construction equipment checkpoint (similar to the concept of a DUI checkpoint) as one way of checking both equipment and the drivers/employees involved with the equipment.

Overland Park volunteered to set up the first checkpoint on March 23, 1998. During the interim, members of the task force contacted all four major television stations, the local newspapers and major radio stations to draw public attention to the task force efforts. The idea behind the checkpoint was to stop every piece of construction equipment or vehicle hauling construction equipment or materials to locate and recover stolen equipment and materials. Members of the Kansas Highway Patrol also wanted to use the checkpoint to identify vehicles exceeding the posted weight limits, using improper fuels and/or operating unsafe machinery. As with DUI checkpoints, notification of the checkpoint had to be published in various forms prior to the date of operation. Once these requirements were met, the checkpoint could be conducted.

The Overland Park crime analyst pointed out that the best location for stopping, weighing and checking vehicles and pieces of equipment was probably 135th Street at U.S. Highway 69. These two streets were the most

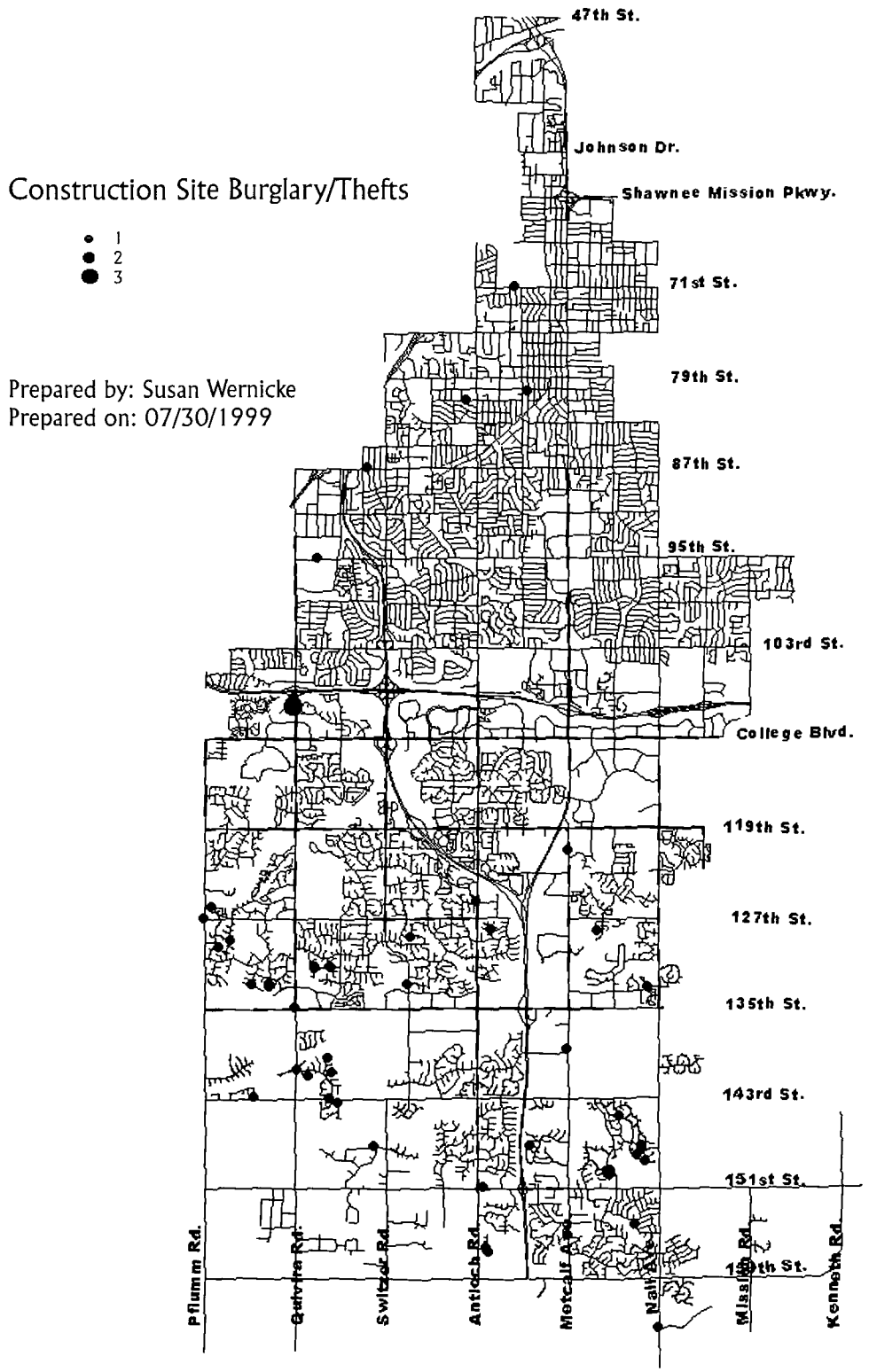

Figure 1
1997 Residential Construction Site Crimes
Overland Park, Kansas

direct, centralized and heaviest traveled routes to and from the majority of the city's construction sites. This site also offered a large (one-acre) former weigh station that could be used as a vehicle staging area. The crime analyst used aerial photographs and the 1997 construction site burglary map to support the recommendation.

With the date and location set, the only remaining decision was who would staff the checkpoint. It was decided that members of the Highway Patrol, the NICB and the Overland Park Police Department (officers and analysts) would conduct the checks. The assistance of the Overland Park Traffic Safety Unit was also requested. By law, anyone within a 5-mile radius who was operating a vehicle hauling equipment or driving an equipment vehicle could be stopped by a traffic officer and instructed to proceed to the designated checkpoint for an inspection. (This was primarily to prevent people from turning around or taking a different exit if they spotted the checkpoint in advance.)

Local media coverage of this first checkpoint operation was extensive. The public was advised not only of the checkpoint's location, but also of the task force's mission. Members of the task force were interviewed on television and radio. Radio "traffic spotters" provided on-air updates of activity at and near the checkpoint. The checkpoint was conducted from 7:00 A.M. to 12:00 P.M. At its conclusion, more than 100 pieces of equipment had been checked with the following results:

- Recovery of one stolen Bobcat
- Citations issued to 32 overweight vehicles
- Citations issued for seven equipment violations
- Citations issued for three improper fuel uses
- Two vehicles deemed unsafe to drive were parked, to be towed away later

Officers were also able to make several warrant arrests, arrests for driving with a suspended or improper (noncommercial) license and arrests for other miscellaneous city ordinance violations. The checkpoint was considered a definite success, headlining one local evening news broadcast. The word was out that the task force, armed with information relating to construction site burglaries and thefts, would be monitoring the construction industry closely in an effort to curb the incidents.

With the success of this checkpoint, additional checkpoints were planned for the remainder of the year. Rather than concentrate only in Overland Park, the task force decided to spread out and include various locations throughout the metropolitan area.

To meet their stated goals, the task force also had to pursue other means of deterring construction site crimes. These efforts included having detec-

tives contact construction crew forepersons on site, provide them with information on the recent trend, and advise them on how to better secure equipment and supplies. On the weekends, detectives scoured job sites in search of equipment with the VIN and/or serial number altered or removed. Equipment not in a secured yard (by fences) could be checked without the consent of the company/owner.

A second major checkpoint was conducted in Shawnee, Kansas, at K7 Highway and Shawnee Mission Parkway—very near another large area of heavy construction. This checkpoint was conducted on June 1, 1998. Forty-one overweight vehicles, 13 equipment violations and one unsafe vehicle were cited. No stolen vehicles were recovered.

Simultaneously with these crime prevention and detection efforts, the CAU continued to feed the task force with information regarding locations with high incidents of criminal activity, as well as information regarding the current status of suspects and other known offenders. Based on the CAU's ongoing analyses, individual agencies set up checkpoints across the Greater Kansas City Metropolitan Area. Since many local contractors work throughout the metropolitan area, having other agencies working checkpoints greatly increased the overall impact and success of the task force's efforts.

CONCLUSION

The efforts paid off, at least in Overland Park. Through the end of 1998, there was a 26 percent decrease (from 50 in 1997 to 37 in 1998) in the number of construction site burglaries/thefts, while the number of residential building permits had increased 42 percent (from 1,178 in 1997 to 1,677 in 1998). Based on the above numbers, 4.2 percent of construction sites experienced some type of crime in 1997, while only 2.2 percent of the sites had a reported crime in 1998. In addition, the monetary amount of property stolen dropped from $139,379 in 1997 to $65,138 in 1998. This positive effect on construction site crimes and amount of loss is credited in large measure to the coordinated efforts of the law enforcement and non–law enforcement members of the Heavy Construction Equipment Theft Task Force.

Through September 1999, there have been only 11 reported incidents in Overland Park. The task force has continued to meet monthly to develop more strategies for fighting construction site crimes. The task force also continues to involve other non–law enforcement agencies with a stake in the construction industry in their decisions and efforts. From a recent checkpoint in Overland Park, an additional piece of stolen equipment (valued at

more than $30,000) was recovered. It was later discovered that it had been stolen from Blue Springs, Missouri; auctioned in New Jersey; and then re-sold in Bonner Springs, Kansas. That recovery, along with 29 citations for overweight vehicles and 11 citations for improper equipment, made this most recent checkpoint another success.

Construction site crimes still occur in Overland Park, but the number of incidents continues to decrease—despite the fact that the number of building permits has increased each year. The crime remains centralized in the southwest portion of the city (see Figure 2); however, officers who patrol the districts, detectives who work the cases and builders who work in the area are aware of the potential for an increase in theft if their guard is let down. The Heavy Construction Equipment Theft Task Force and the Overland Park Police Department have continued to use all available resources (Crime Analysis, GIS/mapping, shared criminal intelligence information and construction industry leads) to fight construction site burglary and theft with marked success.

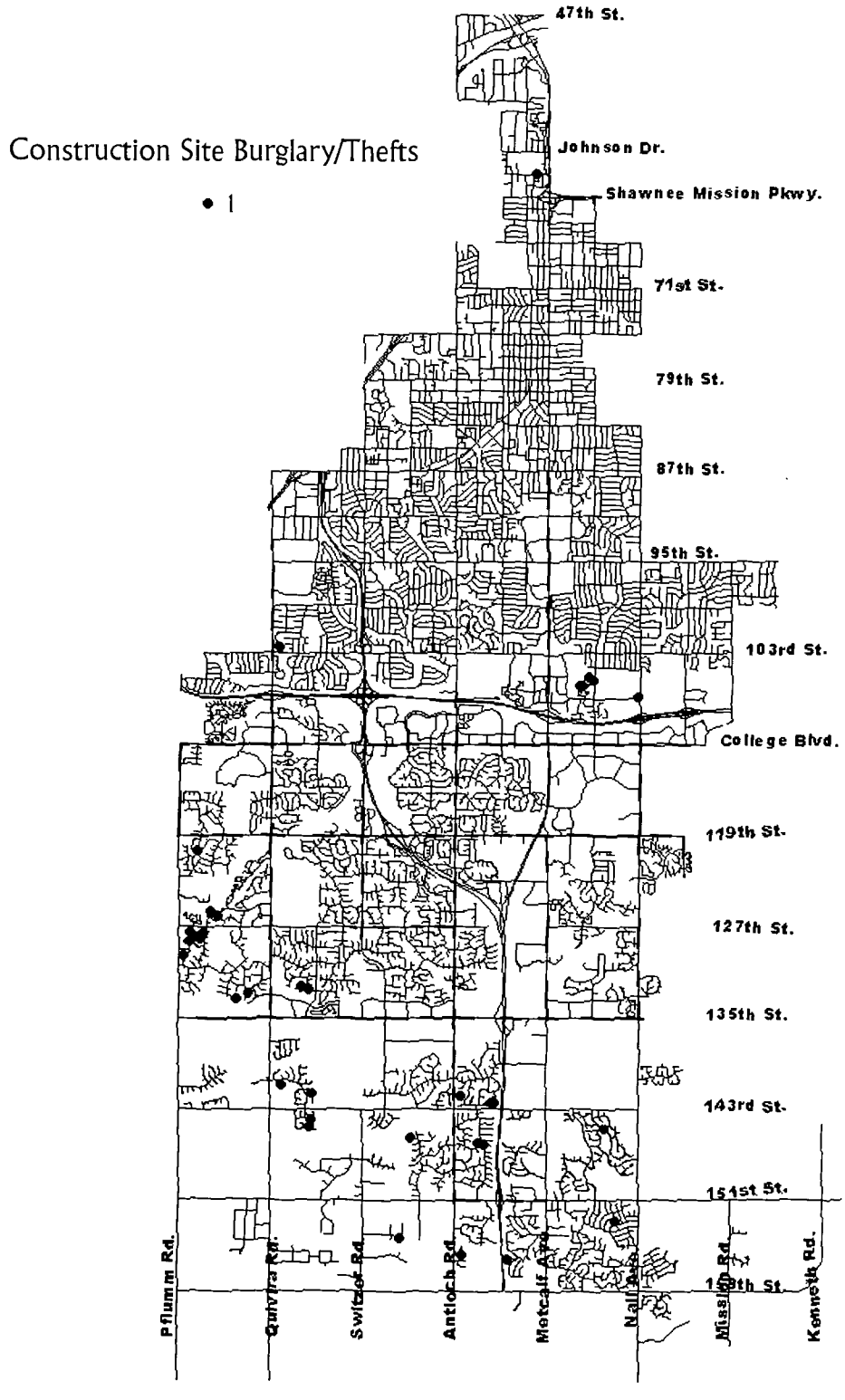

Figure 2
1998 Residential Construction Site Crime
Overland Park, Kansas

ABOUT THE AUTHOR

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Guiding Environmental Design and Neighborhood Problem Solving

Mike Neumann
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Al Ball
Woodlawn, Ohio, Police Department

BACKGROUND

Cincinnati, a large metropolitan area in Hamilton County, is located in southwestern Ohio and borders northern Kentucky and southeast Indiana. The city proper has a population of 364,000 (according to the 1990 census), while the greater tri-state area has an estimated population of 2 million. The city has two major league sports teams, the Cincinnati Reds and the Cincinnati Bengals, drawing an additional 2 to 3 million people into the city each year. The city also has several major institutions of higher learning (the University of Cincinnati, Xavier University and Cincinnati State), which bring 40,000 more people to the city. Cincinnati covers 78 square miles and has 920 miles of roadways, which include three major interstates: I-71, I-74 and I-75.

The Cincinnati Police Division (CPD) has 1,000 sworn officers and 300 civilians. In 1998, there were 25,333 Part 1 crimes and 17,680 Part 2 crimes; CPD arrested 5,744 people for Part 1 crimes and 46,720 people for Part 2 crimes. In addition, CPD answered 276,000 calls for service from the public. CPD implemented community-oriented policing in 1994 in all 53 neighborhoods. CPD is also one institutional partner of the Tri-State Regional Community Policing Institute, established in 1997, which trains in community policing and GIS. With this foundation, it is not surprising that CPD relied on a community partnership and spatial analysis to tackle a rash of property crimes.

THE PROBLEM

CPD, the Klotter Street Homeowners Association and the Cincinnati Public Works Department convened in 1998 to develop a strategy for combating increasing incidents of theft and vandalism in the Klotter Street neighborhood. Police officials believed that the increase in crime was a

result of the recent rehabilitation of several residential properties that had been neglected for years. When urban professionals began to remodel and upgrade these residences into luxury homes, young offenders from the neighboring lower basin area began to prey on these new, more affluent residents. Added police patrols and rapid response had little effect, since the offenders used several sets of hillside steps to enter the area and quickly exit, eluding the police.

Analysis and Mapping

At the request of the Community Oriented Police (COP) Officer, CPD's crime analyst examined Part 1 and Part 2 crime data for the area. The Crime Analysis Unit downloaded all crimes for 1997, 1998 and 1999 (year-to-date) from a network Oracle database and used Microsoft Access to export the data in DBF format for use in ESRI's ArcView. The data were geocoded to the street centerline file.[1] After the data were mapped, crimes in the study area were selected using a hand-drawn polygon and ArcView's "select polygon" feature. The data were then saved for further mapping and analysis.

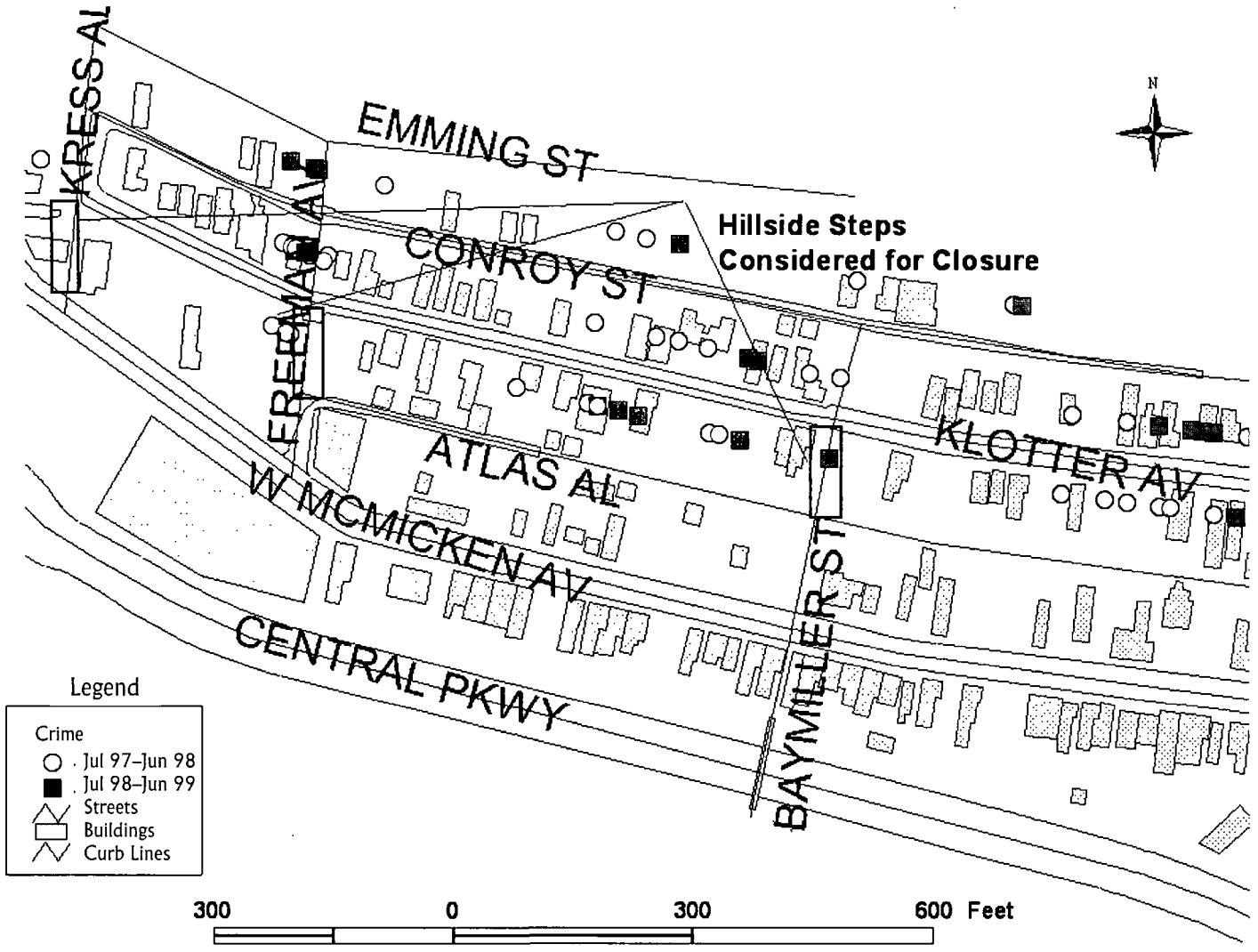
Analysts also imported the crime data into Microsoft Excel to produce tables and graphs. These charts depicted specific crime types by month from July 1997 through June 1998, as well as comparisons of all crimes by month. Initially, maps were made of the area depicting the distribution of crimes. After the step closures, a map was made (see Figure 1) with one year of preclosure crime data (circles) and one year of postclosure crime data (squares). Finally, the crime analyst created a graphic representation of the data that compares the preclosure (July 1997 through June 1998) and postclosure (July 1998 through June 1999) data by crime type (see Figure 2).

Actions Taken

After the Klotter Street Homeowners Association reviewed the July 1997 through June 1998 data, maps and other anecdotal evidence, they determined that the three sets of steps from McMicken Street to Klotter Street were the root of the problem. The steps provided offenders with direct

[1] Although certain addresses had more than one crime, this is not apparent on the map. Examination of the data files is required to locate multiple crime locations.

Figure 1
Preclosure and Postclosure Crime Data



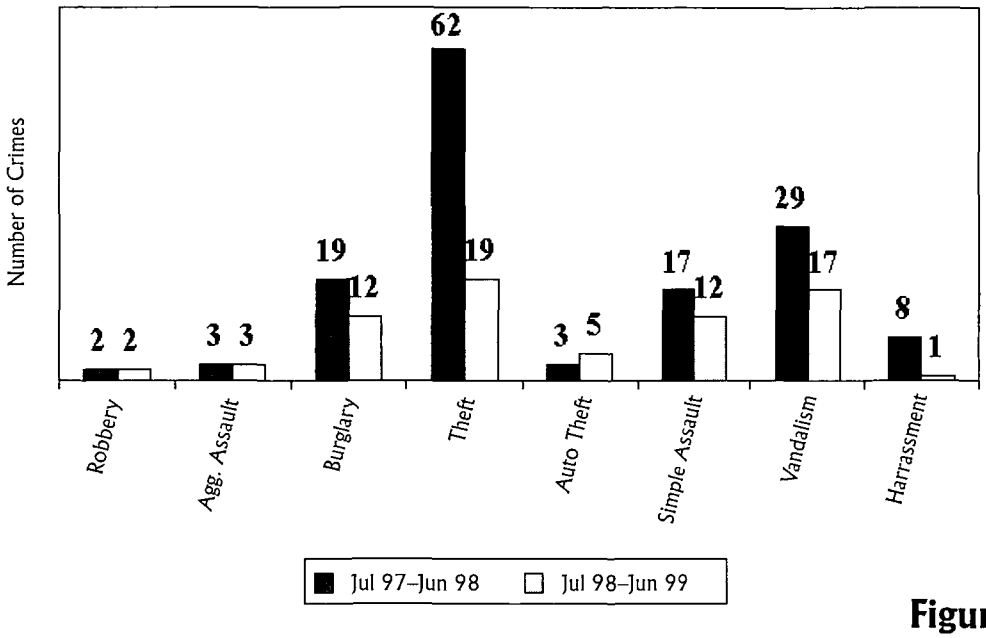


Figure 2
Preclosure and Postclosure Crime Data by Crime Type

access to the areas being victimized. The Association therefore requested that the steps be closed and the area fenced off. In addition, the neighborhood COP officer started a Neighborhood Watch group with the Association to encourage residents to keep an eye out for suspects and take appropriate preventive measures.

In June 1998 the Public Works Department closed the steps from McMicken Street to Klotter Street at the locations of Baymiller Street, Freeman Avenue and Kress Alley (in Figure 1, these sets of steps have rectangles drawn around them). Public Works removed 13 steps on Baymiller Street and erected a 10-foot fence. On Kress Alley, the Department removed the steps and erected a 10-foot fence. On Freeman Avenue, the Department erected a 10-foot fence and installed a locked gate.

While the steps were being closed, the newly formed Neighborhood Watch group took action. Neighbors watched each others' homes and notified the police of any unusual activity.

CONCLUSIONS AND IMPACT

Through its mapping and analysis of the project, CPD has concluded that closing the steps, installing the fences and establishing the Neighborhood Watch group have had a positive impact on the problem. There was a 50-

percent reduction in reported Part 1 and Part 2 crimes for the area; thefts, which were identified as the most serious problem, were reduced by 70 percent. In addition, citizen-generated calls-for-service before and after establishment of the Neighborhood Watch group increased by 12 percent in the study area, while calls-for-service for the year for the entire city increased only 1.5 percent.[1]

[1] CPD is hesitant to attribute this increase to either the Neighborhood Watch group or increased community support and awareness at this time.

About the Authors

Mike Neumann is a Cincinnati Police Officer currently assigned to the Management/Crime Analysis Unit of the Planning Section. He is a graduate of the University of Cincinnati with a bachelor's degree in Criminal Justice. Neumann has been with the Cincinnati Police Division for 25 years. He is also an instructor at the Tri-State Regional Community Policing Institute.

Al Ball is a part-time Police Officer with the Woodlawn, Ohio, Police Department in suburban Cincinnati. He is also involved in graduate studies focusing on police training curricula and instruction. He is an instructor for the Tri-State Regional Community Policing Institute in Cincinnati, Ohio.

Assessing a Neighborhood Watch Program

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Christianne DeMarco
Spokane, Wash., Police Department

As local governments have tightened their purse strings over the last 20 years, police departments have sought innovative techniques for curbing crime. GIS is one important tool for maximizing the time and resources available to a department, and it combines effectively with community-oriented policing (COP) approaches.

In 1978, the Spokane, Washington, Police Department (SPD) began implementing community governance projects designed to educate citizens about the role they can play in ensuring their own safety. Those projects led to two public safety programs currently operating in Spokane: Community Oriented Substations (COPS) and the Spokane Block Watch.

In the COPS program, citizen volunteers help establish a visible law enforcement presence throughout Spokane neighborhoods by participating in community service projects, such as those associated with redevelopment, juvenile delinquency or domestic violence.

The Spokane Block Watch is part of a national program designed to educate residents about home safety and the importance of maintaining good communication with neighbors. Since the national program's inception in 1978, more than 1,400 neighborhood blocks with more than 24,000 Block Watch members have organized to prevent crime throughout the United States. The program in Spokane is now one of the largest in the nation.

Having recently experienced a wave of retirements by seasoned officers who were hired under federal funding when Spokane hosted Expo 74, SPD is now a relatively young, small force with minimal personnel to accommodate the increase in population. Therefore, police officials must maximize every possible resource to promote and enhance public safety in Spokane. As such, the Block Watch is an important asset of SPD, and it has been fully integrated into the department's organizational structure.

Is the Program Working?

When the Spokane City Council appropriated funding for the continuation of the Block Watch in 1998, it stipulated an evaluation of the program. To satisfy this requirement, SPD's Planning and Research Unit set out to determine if the Block Watch was fulfilling its founding goals, which were 1) to reduce the fear of crime in neighborhoods with a Block Watch group and 2) to reduce the actual number of calls-for-service (CFS)[1] received by SPD in a Block Watch neighborhood. The Unit determined that a survey would be the most effective means of answering these two questions; police officials expected that the survey results could significantly affect the direction of all of Spokane's community policing programs.

Mapping and Analysis

Using SPSS, SPD's Planning and Research Unit and Washington State University's Division of Governmental Studies and Surveys (DGSS) conducted several regression and correlation analyses on different responses to the survey questions. For example, one analysis addressed the question, "Do the results of the fear-of-crime question correlate to the question that asked the age of the respondents?"

SPD also produced several thematic maps. One was of response delimiters[2] of the Block Watch database used for sending out the survey. A thematic map of active Block Watch neighborhoods compared the percent change in CFS from 1997 to 1998[3] for active Block Watch neighborhoods and the entire city of Spokane. Lastly, a thematic map of Block Watch areas tracked the number of offenders out on active parole within those areas.

A third analysis of active Block Watch neighborhoods showed the relationship to fear-of-crime data from previous surveys conducted through-

[1] The CFS in this study include incidents received from the public as well as those initiated by a police officer.

[2] The delimiters were used to designate the following: 1) bad address, 2) good address but no response to survey and 3) good address and response to survey.

[3] Both CFS received from the public and those initiated by an officer were used for 1997. Only those calls received from the public were used for 1998. Because they cannot be geographically referenced, however, calls initiated by an officer constituted less than 8 percent of the total geocoded calls for 1997 and were thus deemed insignificant.

out Spokane. This compared the Block Watch neighborhoods with the average fear-of-crime response for citizens of Spokane and across the nation[4] (see Figure 1).

The Mapping and Analysis Process

The department has used several software programs in the analysis phase, including SPD's CAD system, SPSS, Microsoft Access and Excel, ESRI's ArcView and S Plus, an ArcView extension. As the analysis progresses, more ArcView extensions (such as Spatial Analyst and 3D Analyst) will be brought in.

Handling hundreds of thousands of records (CAD incidents and survey respondent data) made the analyses long and difficult. The GIS analysis complemented the statistical tests done in SPSS, which was used to observe relationships among response categories. All the data sets were easily imported into ArcView, and the GIS helped SPD analysts draw conclusions about relationships that were not readily recognized or proven with traditional, tabular statistical methods.

Recognizing Trends with GIS

Interestingly—and seemingly in direct opposition to a main goal of the Block Watch program (reducing fear of crime)—survey results revealed an increased fear of crime in Block Watch neighborhoods for some crimes. Yet even though Block Watch members were more fearful of specific crime types, they felt as safe overall as the average Spokane citizen walking in their neighborhood alone at night. One explanation for the fact that residents in Block Watch neighborhoods had greater fear of specific crimes than the general public is the high concentration of active offenders under State DOC supervision who claim residence in more than 47 percent of Block Watch neighborhoods (see Figure 2).

Another result of mapping survey findings relates to the geographic distribution of CFS. Spokane experienced a rise in call incidents from 1997

[4] All questions asked in the Spokane Citizen Survey (1997) and the National Survey (1995) were identical in word and form to the questions asked in the 1999 Block Watch Survey.

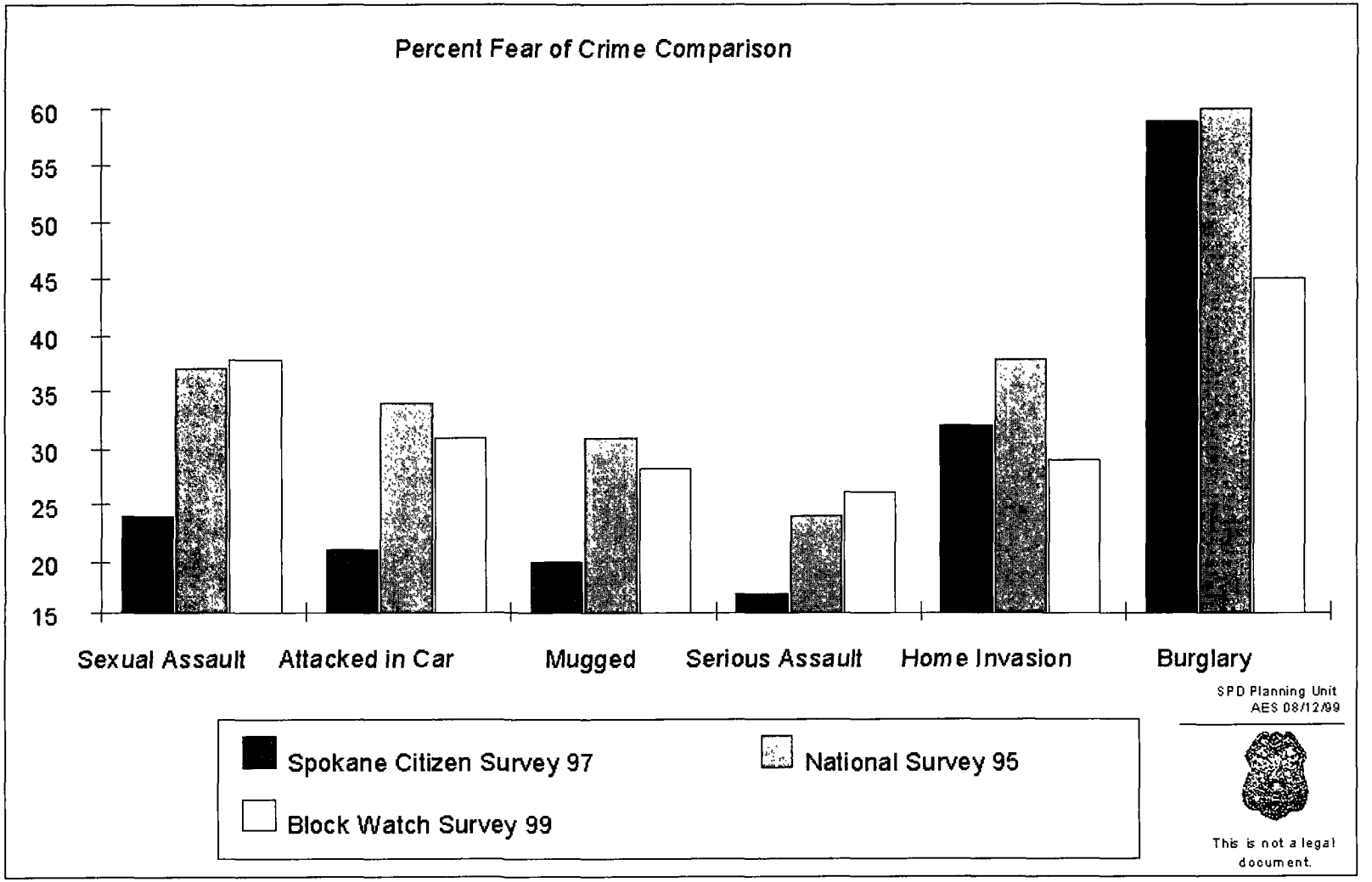


Figure 1
Fear-of-Crime Responses by Crime Type

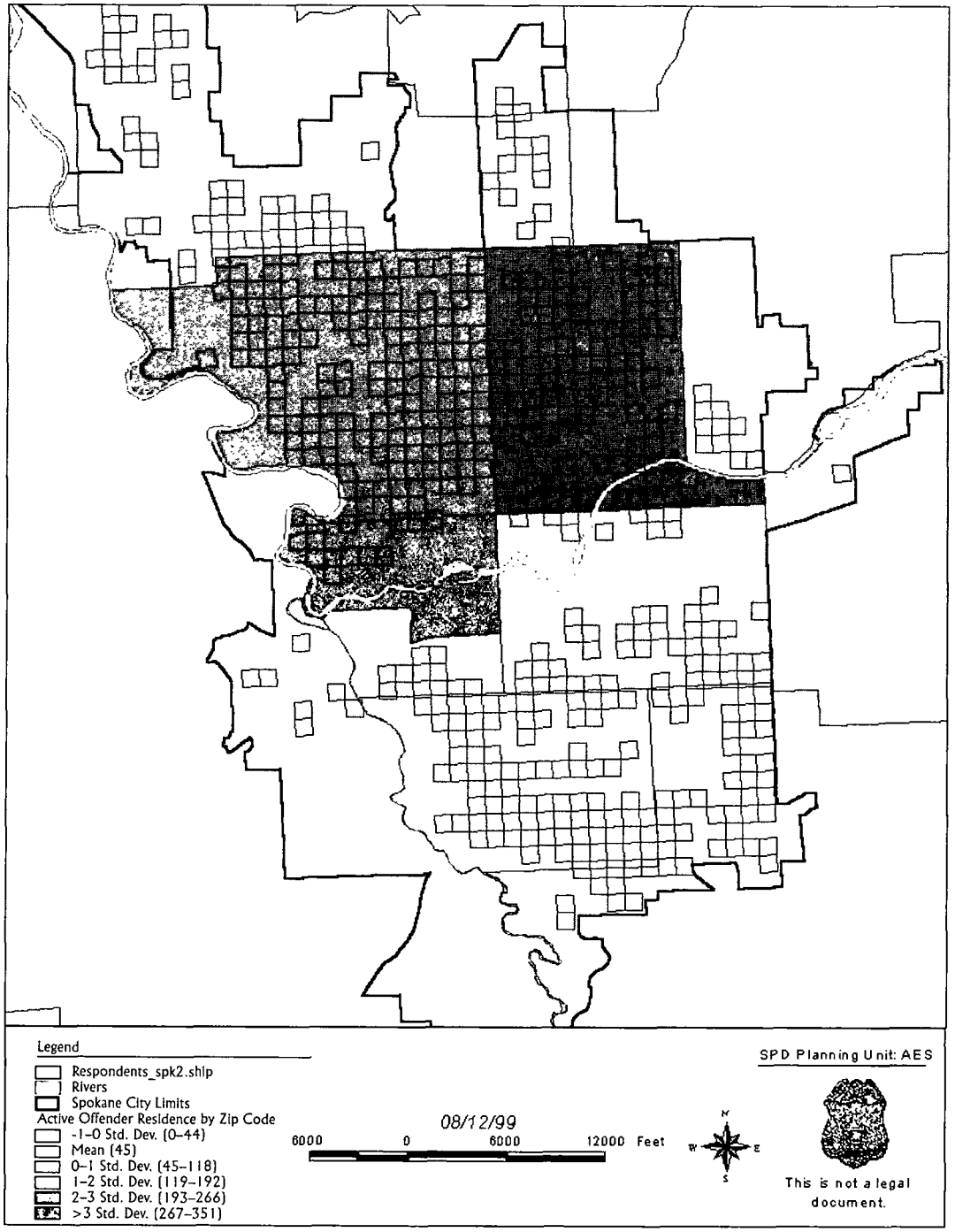


Figure 2
Active Offenders Residences Who Are Supervised "Face to Face" by State DOC by ZIP Code vs. Active Block Watch Neighborhoods

to 1998, and analyses showed that the majority of Block Watch locations were in areas where call incidents had increased to a greater degree than in the city overall. This finding was not consistent with one of SPD's goals for the Spokane Block Watch, which was to reduce CFS. It should be noted, however, that implementation of Block Watch and other community-policing initiatives often results in increased CFS due to residents' greater involvement in crime issues, as well as their increased willingness to report crimes to the police (see Figure 3).

GIS was also used to investigate the geographic distribution of Block Watch participants. In addition to documenting a relatively low level of involvement and activity among identified volunteers, the analysis resulted in three findings. First, there are significant geographic concentrations of Block Watch participation and equally significant areas with little Block Watch participation. Second, the distribution of participants complements, rather than duplicates, COP Shop activity. Third, identifying participant concentration lets program managers address a frequently raised concern among Block Watch participants—that they have operated without information concerning the activities and experiences of other neighborhoods and Block Watch participants in their area. Taking advantage of current technology to provide that information is significant for future program activities.

In Summary

There were several other significant findings from the survey. A series of questions concerning COPS was presented to assess Block Watch volunteers' views of that program. Perhaps not surprisingly, Block Watch volunteers were more supportive of such policies and somewhat more willing to help the department in such activities than were the general citizenry.

When asked directly to assess the value of the Block Watch program—both to them personally and to Spokane—Block Watch participants were uniformly supportive of the program. Most rated it as of "Fair Value" or "Very Valuable" for them personally, to their neighborhoods, to the city and for crime prevention and apprehension of offenders. When asked to rate the program in terms of the support they received from the program office, a majority of participants again rated the program as quite satisfactory. Responding volunteers did indicate, however, that only about one-quarter of Block Watch members were truly active in the program.

The results of this survey have initiated an across-the-board comparison of community and public safety-based programs within Spokane. The goal is to look for duplication of programs and to determine if there are vast differences in the demographics of people who volunteer.

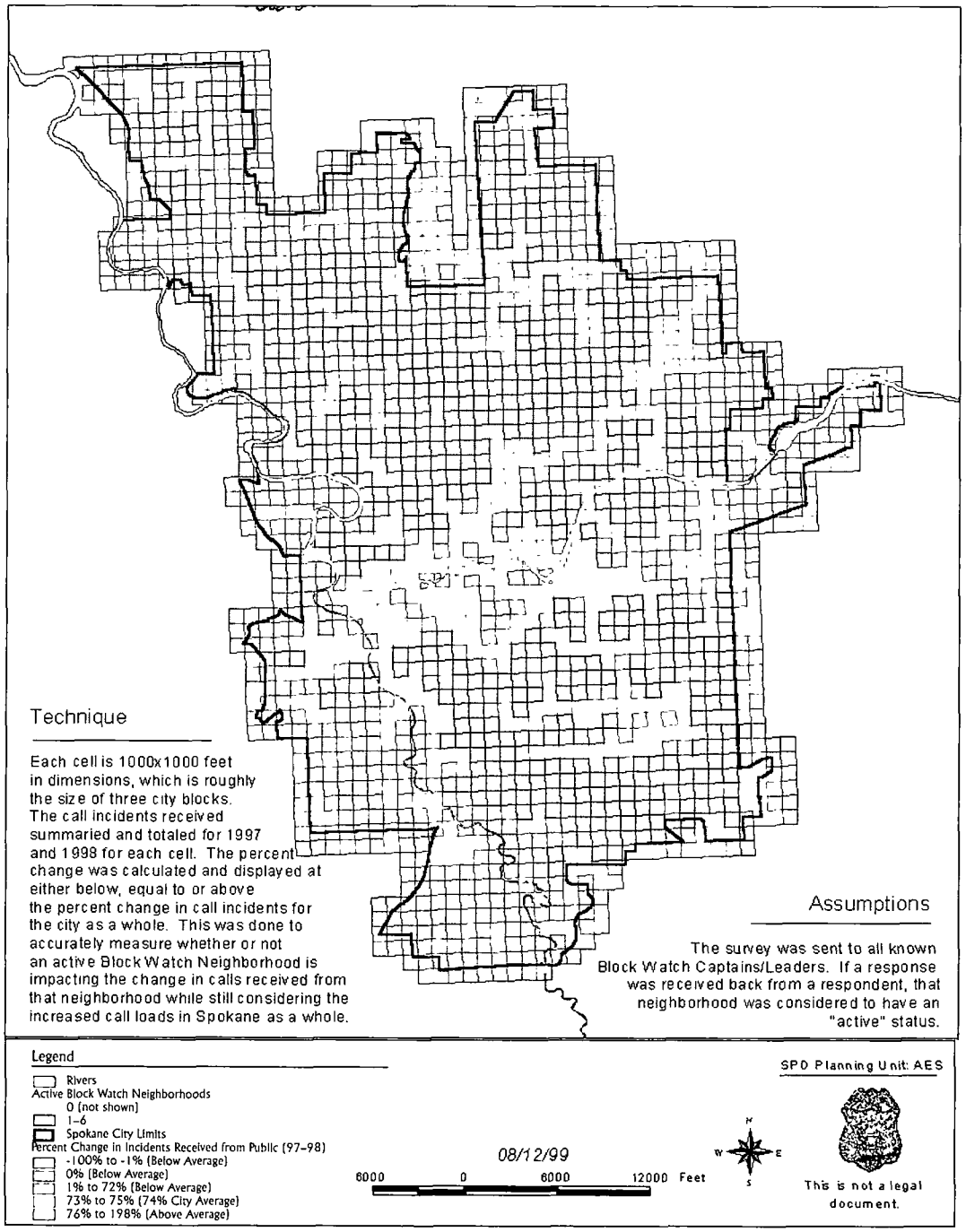


Figure 3
Percent Change in Call Incidents Received from the Public Below, Equal to or Above Citywide Average (74%) vs. Active Block Neighborhoods

In a related effort, SPD is preparing to place crime density maps on the Internet so Block Watch Captains can see hot spots and crime around their blocks, as well as throughout greater Spokane. The use of GIS has already enhanced this assessment process and will continue to be used to work and communicate with the Block Watch and the general community.

About the Authors

Ariane Schmidt graduated from Oral Roberts University with a bachelor's degree in Mathematics and a minor in Chemistry; she is currently working on her master's degree with an emphasis in Management Information Systems (MIS) at Gonzaga University. Schmidt worked for CPF Money Processing Systems, Inc. in Special Projects and Marketing Development prior to joining the Spokane Police Department (SPD) in 1997 as Lead Analyst. She became a police planner for the SPD in 1998 and in November 1999 became a GIS programmer for the City of Spokane. Schmidt provides user support, training and development to all ESRI ArcView users throughout Spokane, including weekly on-site work with SPD.

Michael J. Gaffney is pursuing a doctoral degree in Political Science at Washington State University (WSU), with emphasis in Public Administration and Public Policy. His research interests include social capital, volunteerism, crime prevention, ethics and community-oriented policing (COP). Gaffney holds bachelor's and law degrees from the University of Idaho and is the research coordinator for the Division of Governmental Studies and Services at WSU. This article reflects his involvement in the assessment of citizen attitudes, the institutionalization of COP and organizational structure for the Spokane Police Department.

Christianne DeMarco began her career in the Spokane Police Department's Records Unit. From there, she transferred to the Planning and Research Unit, where she currently works as chief researcher. While obtaining her master's degree in Criminal Justice from Washington State University, DeMarco worked for the Western Regional Institute for Community Oriented Public Safety (WRICOPS) as a research assistant. WRICOPS serves a five-state region, providing training and technical assistance and conducting on-site assessments, citizen and employee surveys and evaluations.

Aiding Apprehension and Prosecution Efforts

54

Identifying a Serial Indecent Exposure Suspect

Kathleen Woodby and Al Johnson
Austin, Tex., Police Department

This case study describes the process used to track incidents of indecent exposure committed by a single offender in Austin, Texas. It details how a crime analyst used geospatial and pattern analysis in combination with environmental surveys to narrow the search area, as well as to predict the times and dates of the suspect's future crimes—ultimately leading to apprehension of the offender.

Policing in Austin

The Austin, Texas, Police Department (APD) consists of 1,186 police officers and more than 500 nonsworn personnel who provide public safety services to the city of Austin. APD uses a neighborhood-based, community-policing philosophy grounded in problem solving. For policing purposes, the city is separated into six geographical Area Commands. Each Area Command is subdivided into 10 to 12 police districts staffed by seven shifts of district officers. In addition to district officers, each Area Command has support resources consisting of Division Detectives, Motorcycle Officers, Street Response Units and District Representatives. District Representatives coordinate responses to neighborhood problems, and Street Response Units provide targeted enforcement for hot spots of criminal activity.

Crime Analysis in Austin

Personnel: APD's Crime Analysis Unit consists of nine full-time analysts and a supervisor. One analyst is assigned to each of the six Area Commands, and the remaining three analysts are assigned to centralized units.

Technical: The bulk of the data processed and analyzed by the unit is taken from a mainframe computer and downloaded into Microsoft Access 97 databases. Due to limitations of Access in a client/server environment, SQLServer 7.0 has been installed and is the database driver for the unit. ESRI's ArcView is used for the mapping application. All tabular data for

ArcView comes from ODBC connections to networked databases. ArcView is run from a quad-processor server with 520 MB of RAM.[1] Spatial analyses are accomplished using ESRI's Spatial Analyst.

Process: All decentralized analysts produce daily bulletins of crimes specific to their Area Commands. They also produce daily crime maps and hot-spot maps if needed and weekly and monthly crime summaries.

Case Study

The offenses under consideration occurred in Baker 3 and 4 in Central West Area Command. This area incorporates the downtown business and entertainment area at the center of Austin. The University of Texas campus takes up a large portion of Baker 3, which includes rental homes, older apartment complexes and student-related small businesses. An established, politically influential, inner-city neighborhood called Hyde Park makes up the majority of Baker 4. This area also consists of a mixture of older homes, rental homes, small shopping centers and apartments, as well as a golf course, a refurbished shopping mall and churches. There is heavy vehicular, bicycle and foot traffic within both districts. Both districts are approximately 5 square miles and are densely populated.

Serial Activity Begins

On a Thursday in early March 1999, a White male, approximately 17 years of age and wearing khaki cargo-style pants, approached his first known victim at a bus stop. He asked her about a bus route and then asked a question about oral sex. The victim noticed the subject had begun to masturbate. The subject calmly walked away from his victim.

The following day, the same subject approached his second and third victims. Again, the subject was reported to be wearing baggy khaki pants. He gained the victims' attention by asking questions about bus routes. He followed this by asking the same question regarding oral sex. The subject then exposed himself as he masturbated. He grabbed at the breasts of the second victim and the hips of the third victim. These incidents were within six minutes and two blocks of one another. At this point, the Sex Crimes

[1] ArcView is very stable in this environment.

Unit was contacted about the series of events, and the Central West crime analyst began logging the incidents. A fourth incident was reported four days later and four blocks from the third incident. The physical description and clothing of the suspect remained the same as in previous incidents. In addition, the victim in this incident was the second to describe the subject as seeming mentally "slow."

TRACKING THE OFFENSES

A pin map was created using ArcView 3.1 to show the geographic relationships of the offenses (see Figure 1). All incidents were within a half-mile; two were within the boundaries of Baker 3 and two within Baker 4.

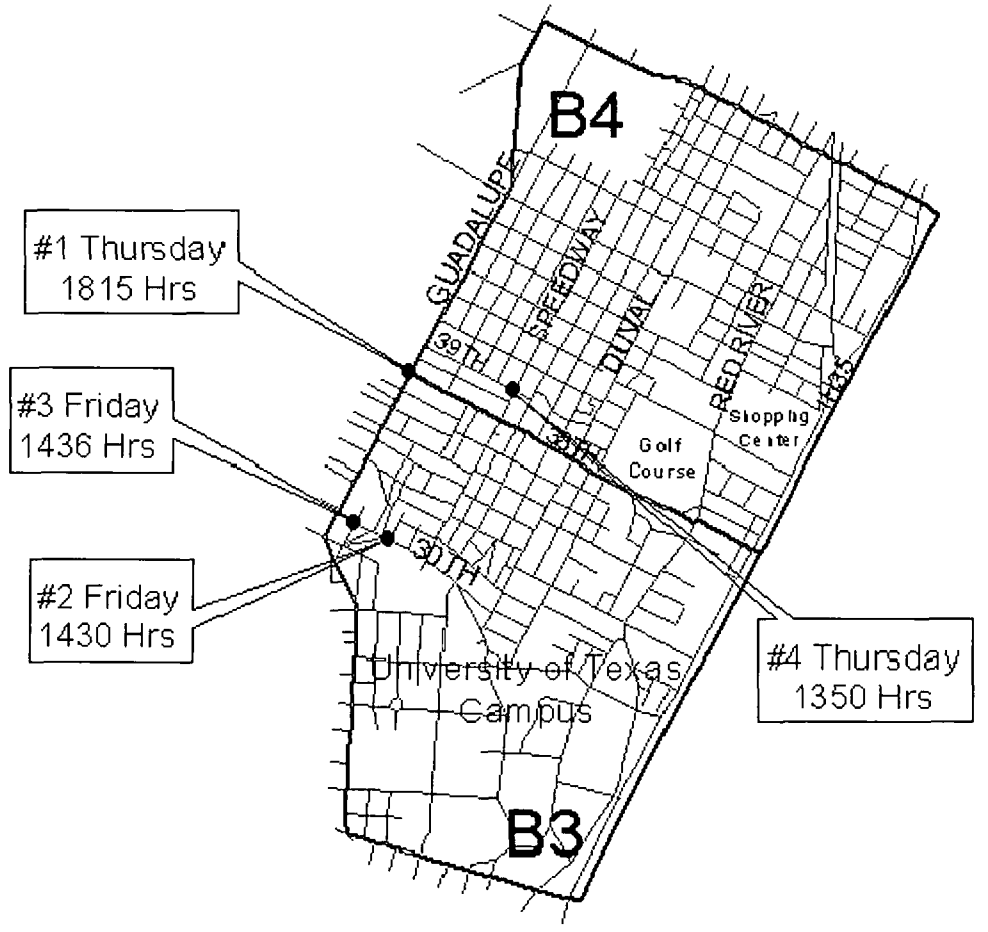


Figure 1
Spatial and Temporal Analysis of Serial Offenses

A Crime Alert and a "Be on the Look Out" (BOLO) were issued following the fourth incident. These bulletins were distributed to all patrol supervisors and posted on the bulletin board outside patrol show-up. The bulletins gave a description of the subject, his pattern of activity and the times, dates and locations of the crimes.

After the fourth attack, the first of several environmental surveys was conducted. The purpose of the first survey was to determine which employers within the immediate area had baggy khaki pants as a part of their dress code. Several possibilities were located; the most notable was located in a nearby shopping center.

The crime analyst also visited the incident locations to determine whether similarities existed in the topography. When traveling between locations, the analyst noticed a fire station and interviewed the firefighters about the area. They were specifically asked about the location of halfway houses because of the close proximity to the state hospital and because the subject was described as "slow" and appeared to be too young to be living independently. The firefighters were also given a description of the suspect and asked if they knew the subject. The locations of halfway houses were noted and plotted on the pin map. The detectives assigned to the case were notified.

All of the subsequent incidents, with one exception, occurred in Baker 4 and were within 0.6 miles of the first four incidents.

In April, after the sixth incident, the crime analyst posted a synopsis of each incident on the dry-erase board in patrol show-up. The board was updated after each additional incident. A second BOLO also was issued. Officers were notified that, due to the subject's apparent comfort level with his environment, it was believed he either lived or worked in the area. The BOLO gave two areas in which patrol effort should be concentrated and provided a narrow time frame.

For unknown reasons, there were no additional offenses for 39 days. When the subject did reoffend, it was within blocks of prior offenses; the suspect was wearing the same clothing, and the MO remained similar. There was, however, a slight shift in the location type: Besides victimizing women walking or standing near a bus stop, the subject began approaching women in apartment parking lots. Additional analysis did not show any patterns in the age or physical characteristics of the victims. Therefore, the emerging pattern was based on geography, time and a physical description of the subject, his clothing and MO.

A second map was created in the first week of May (see Figure 2). It was posted for patrol officers and given to Sex Crimes investigators. The emerging pattern showed a spatial concentration around a five-block area. When combined with the environmental surveys, the analysis supported

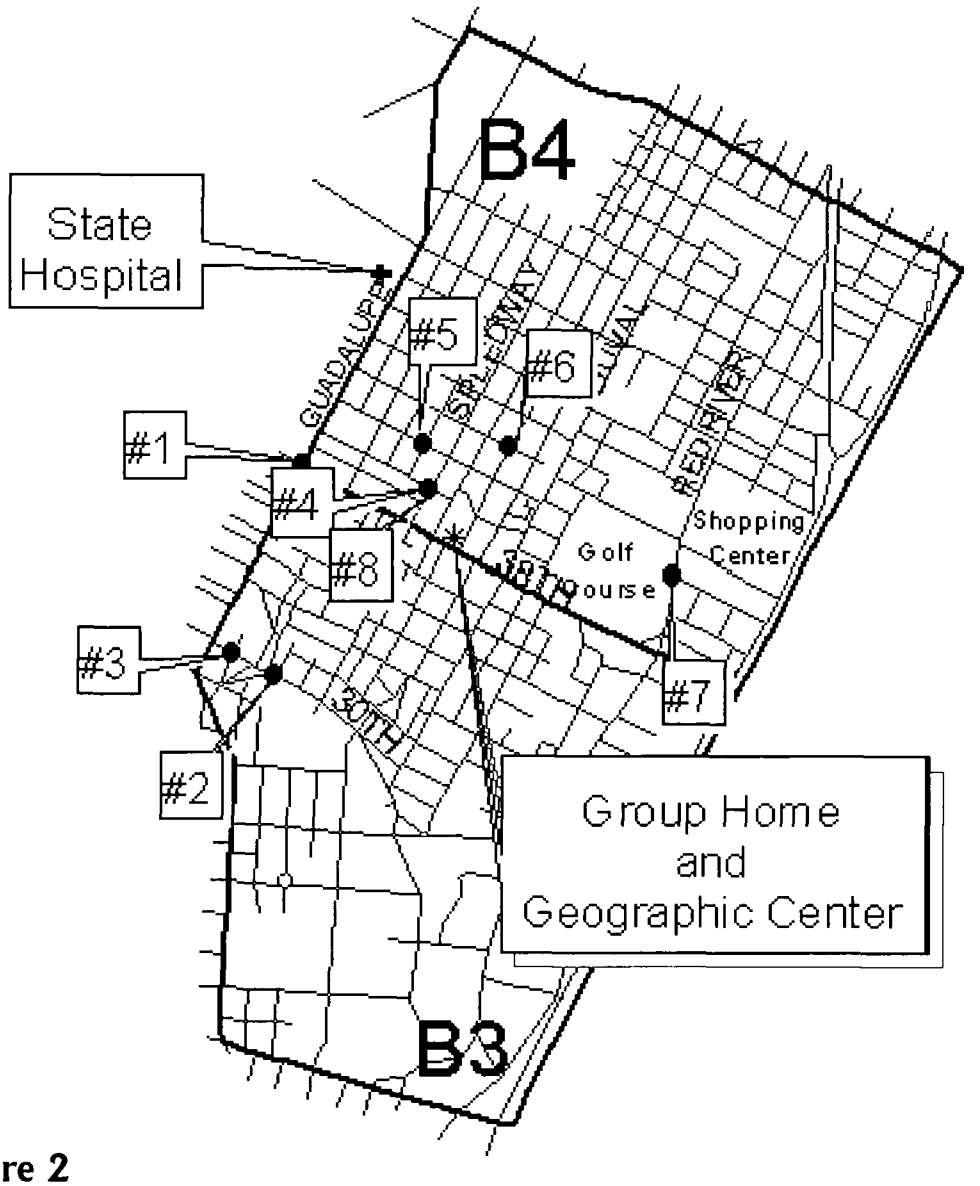


Figure 2
Spatial and Temporal Analysis of Serial Offenses, May 1999 (Week 2)

the possibility that the subject worked in the shopping center located on a particular corner of that five-block area. Another possibility was that the subject lived in the area. If so, the analyst speculated—based on neighborhood housing patterns—that the offender lived a short distance south of the main offending area.

A third map created at the end of May revealed an arched pattern to the incidents; to the side of the arch was the previously identified shopping center (see Figure 3). The subject's routes of travel before and after the incidents (when known) were then overlaid in an effort to determine his home base or anchor point. By this time, it was evident that the subject

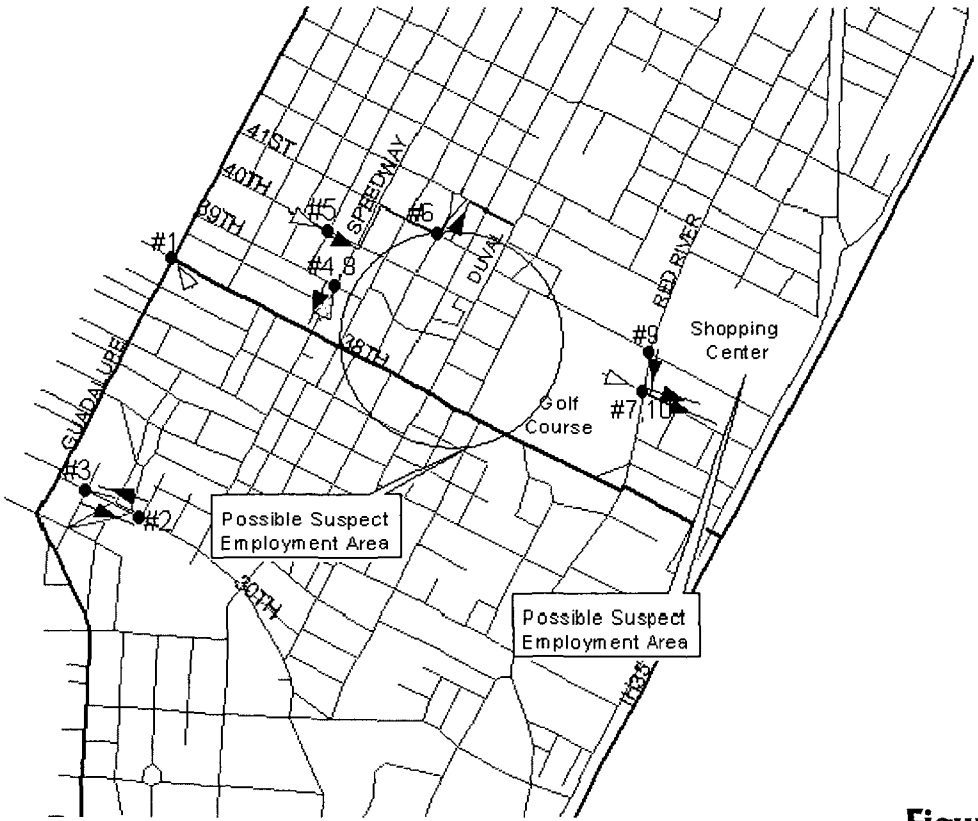


Figure 3
Spatial and Temporal Analysis of Serial Offenses, May 1999 (Week 4)

was not committing offenses on the weekends. This observation supported the analyst's belief that the subject worked, rather than lived, within a few blocks of the area of concentrated activity.

Surveillance operations conducted by the Sex Crimes Unit were focused on the area identified by the analyst. Both field officers and detectives concentrated their efforts in the neighborhood during the time spans identified by the analyst. An intensive effort was made to catch the offender in the act.

In mid-May, the subject followed and grabbed his 11th victim. Both behaviors were viewed as an escalation in the series of events. Also of interest was the location of this attack—an area approximately two miles southwest of all previous activity. It was later discovered that the attack occurred on a major thoroughfare served by one of the bus routes passing through the suspect's center of activity.

By the end of May, the subject had 12 reported incidents to his credit. One victim helped produce a composite sketch of the suspect, and the other victims concurred that the sketch resembled the subject. Detectives showed the composite to bus drivers servicing the area. The composite was also distributed to patrol officers and district representatives.

Making the Arrest

With each new incident, further analysis was conducted in an effort to predict future behavior. On May 18, the analyst speculated the subject would strike again between May 21 and May 24. This speculation was posted in show-up and given to investigators. The prediction missed the mark by 14 days. On June 8, the suspect physically assaulted a 13th victim. On June 10, the subject followed another victim to her apartment and pushed his way in. But when the suspect fell down during the attack, he discontinued his pursuit.

After the June 10 incident, speculation was strong that the suspect would attack again within seven to 10 days. A description of the series of events was posted and distributed again. The subject struck two more times, both on June 18. During the second attack (his 16th offense), the suspect was arrested. In the minutes following the report of the 15th incident, officers had focused their attention on the areas previously identified as the suspect's center of activity. Because of widespread awareness about the case, the arresting officer recognized the suspect when he was observed near the 16th victim.

After the arrest, a final map was produced depicting all known offenses and the arrest location (see Figure 4). When the subject's place of employment was plotted, it was within the area highlighted by the analyst, three blocks north and four blocks west of the potential workplace identified by the analyst. The 17-year-old subject wore baggy khaki pants and a t-shirt to work each day. His work hours were Monday through Friday from 8:00 A.M. to 3:00 P.M., and his father typically picked him up around 5:00 P.M. He lived outside the city limits. One felony and four misdemeanor charges have been filed against the subject at this time.

Conclusion

This case demonstrates the highly effective degree to which technology can be applied to a real-world problem that directly affects the quality of life in a neighborhood. It also highlights that the correct application of technology can lead to a practical end result: the arrest of an offender. It must be noted that it was not technology alone, but the addition of environmental surveys that enabled the analyst to gain a full picture of what was occurring. It was very much a team effort, with the analyst as a pivotal point person for information processing, dissemination and coordination.

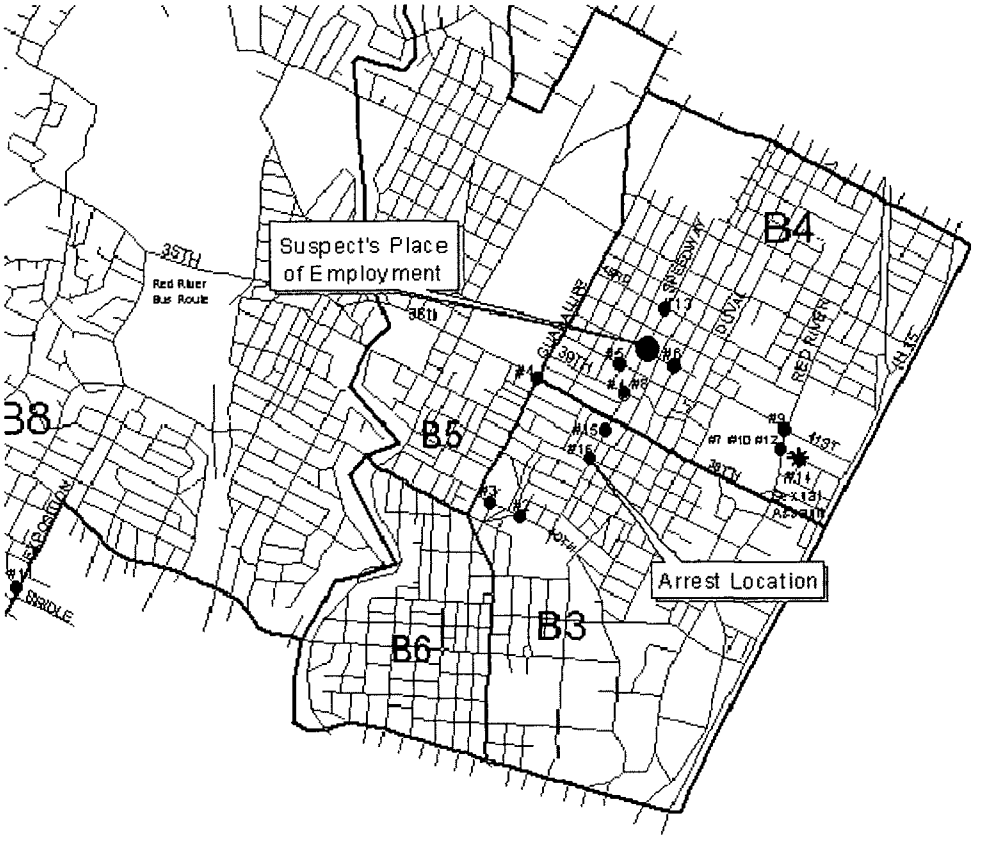


Figure 4
Known Offenses and Arrest Locations

About the Authors

Kathleen Woodby is a senior crime analyst with the Austin, Texas, Police Department assigned to Central West Area Command. She has worked in law enforcement for 23 years and has been employed with APD for 13 years as a staff inspector, police planner and crime analyst. Woodby holds a bachelor's and master's degree in mass communications and journalism from the University of North Texas.

Al Johnson has been associated with the Austin, Texas, Police Department since 1993. He started as a volunteer, moved to a grant-funded crime analyst position and was eventually promoted to manage the implementation of an expanded, decentralized Crime Analysis Unit. He has supervised the Crime Analysis Unit since 1998. Johnson holds a bachelor's in Criminal Justice from San Diego State University and a master's in Human Services from St. Edwards University.

Breaking Alibis Through Cell Phone Mapping

Peter Schmitz and Antony Cooper
Council for Scientific and Industrial Research

Andrew Davidson
South Africa Police Service

Kevin Roussow
Cape of Good Hope Office of the Director of Public Prosecutions

BACKGROUND

In February 1998, at approximately 7:50 P.M., a couple was hijacked outside their home when they returned after a day spent visiting family. The four attackers waited at the couple's house in their own vehicle. When the couple arrived, two of the attackers forced their way into the couple's car at gunpoint and made the couple drive away. The other two attackers left shortly thereafter in their own vehicle. The couple was taken to a desolate area, shot and killed. Their stolen vehicle was delivered to a person who had previously "ordered" such a make and model of vehicle.

Two days later, the same attackers executed a second hijacking, using their own vehicle to follow a man and his son before hijacking them. These victims were relatively fortunate: They were taken to a remote area and tied to a tree, but their lives were spared. During that same night, just after midnight, the attackers hijacked a couple visiting Signal Hill near Cape Town, South Africa. The couple was held hostage while the gang traveled around in their car and the couple's car; the couple was later murdered execution-style. Evidence showed the woman was also raped prior to being shot.

Two of the suspects (whom DNA analysis later proved had raped the woman) were killed in a shootout with police while attempting to evade arrest. The investigating officer learned that the woman's cell phone was missing and obtained the number from her family. To trace her phone, he obtained a warrant for its detail billing. The cell phone records revealed that a particular number had been called on 12 occasions at approximately the time she was last seen alive. The owner of that number was traced, and those cell phone records confirmed that the phone had received the 12 calls. The receiving phone's owner stated to police that he had lent the

phone to his brother-in-law, one of the suspects who was shot and killed in the shootout with the police. Further investigation revealed that the attackers used both cellular telephones and were in constant contact with each other from the time of the hijacking until shortly after the murders, lasting about 52 minutes and ranging over 50 kilometers.

During the first hijacking, one of the accused allegedly made a phone call from a public telephone to the cell phone of a co-accomplice who was driving the hijacked vehicle. During the third hijacking, the accused robbed the victims of their cell phone and, while driving away in the hijacked car, called their co-accomplices, who were following in another car. Police subsequently obtained a warrant to acquire the call logs of the two cellular telephones and the locations of the base stations and their respective coverage areas.

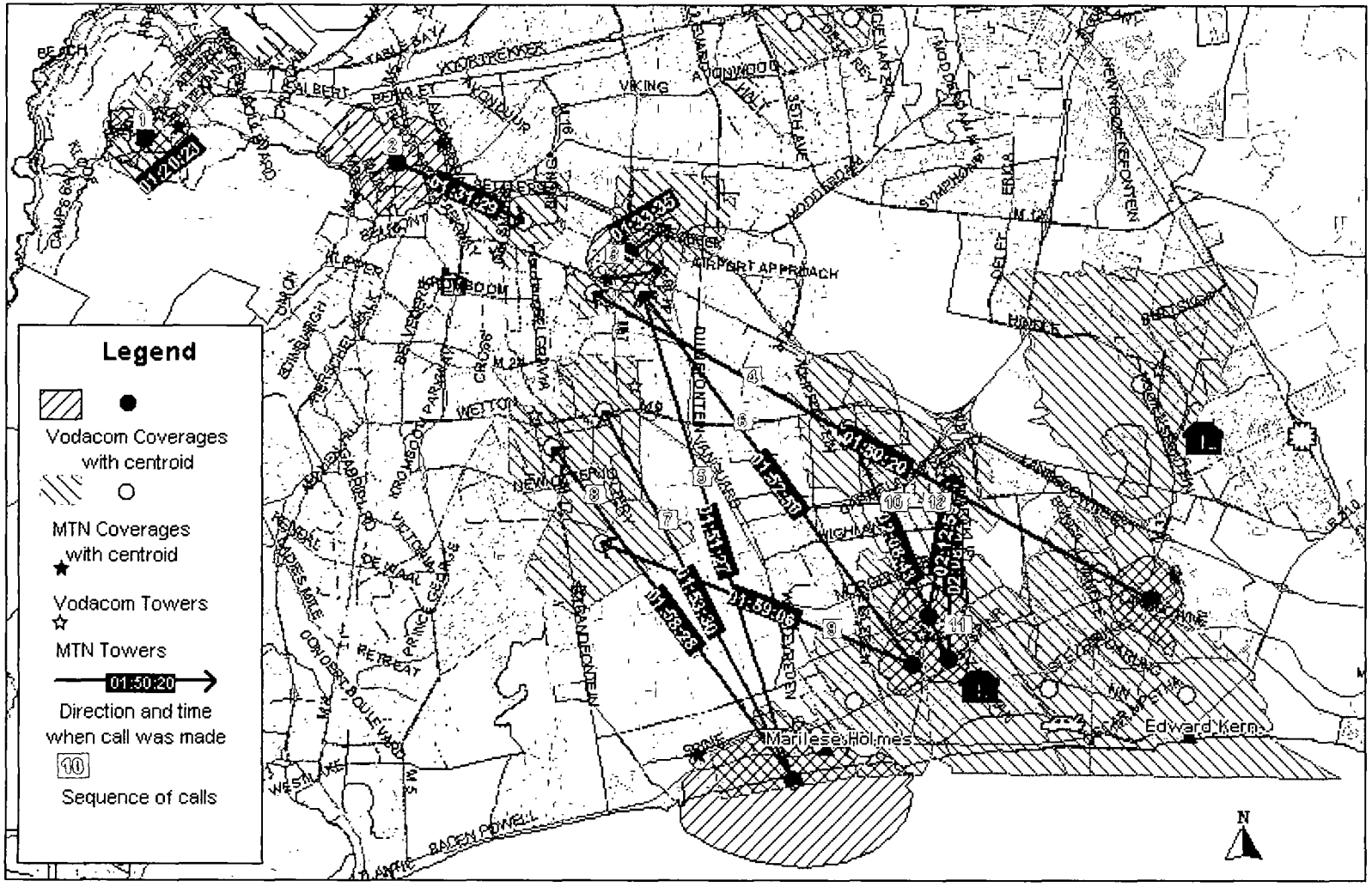
Seeking assistance in the prosecution of the hijackers, the state advocate from the Office of the Director of Public Prosecutions (Cape of Good Hope, Department of Justice) requested the investigator to produce maps depicting the defendants' cell phone usage. The maps were produced by a GIS expert at the Council for Scientific and Industrial Research (CSIR), a research organization based in Pretoria, South Africa.

ANALYSIS

Using MapInfo Professional Version 4.5, analysts mapped the locations of the cell phones when defendants called each other during the hijacking incidents. Analysts also mapped the base stations, their coverage areas, the centroids of the coverage areas and other locations of importance to the case, such as where the suspects and witnesses lived, where the bodies were found and where the hijacked vehicle was recovered. The final product was a roughly 3-foot-by-4-foot map of the area (see Figure 1).

Using data supplied by the cell phone service providers, analysts plotted the calls on the map. Arrows linked the centroids of coverage areas where the cell phones were located during the calls. The arrows also showed from which coverage area the call was made. The arrows were numbered sequentially to show the sequence of the calls and annotated with the time the call was initiated (see Figure 2). The locations of the suspects, witnesses and crime scenes were captured using heads-up digitizing, with the investigating officer indicating the locations on-screen (see Figure 3). The original map served as a prosecutorial exhibit. Copies were also provided before the original was submitted as evidence (one each for the judge, the two assessors, the prosecution, the defense and the investigating officer).

Figure 1
Location of Cell Towers and Their Coverages, Incidents, Places of Interest and Calls Made on 5 January 1998



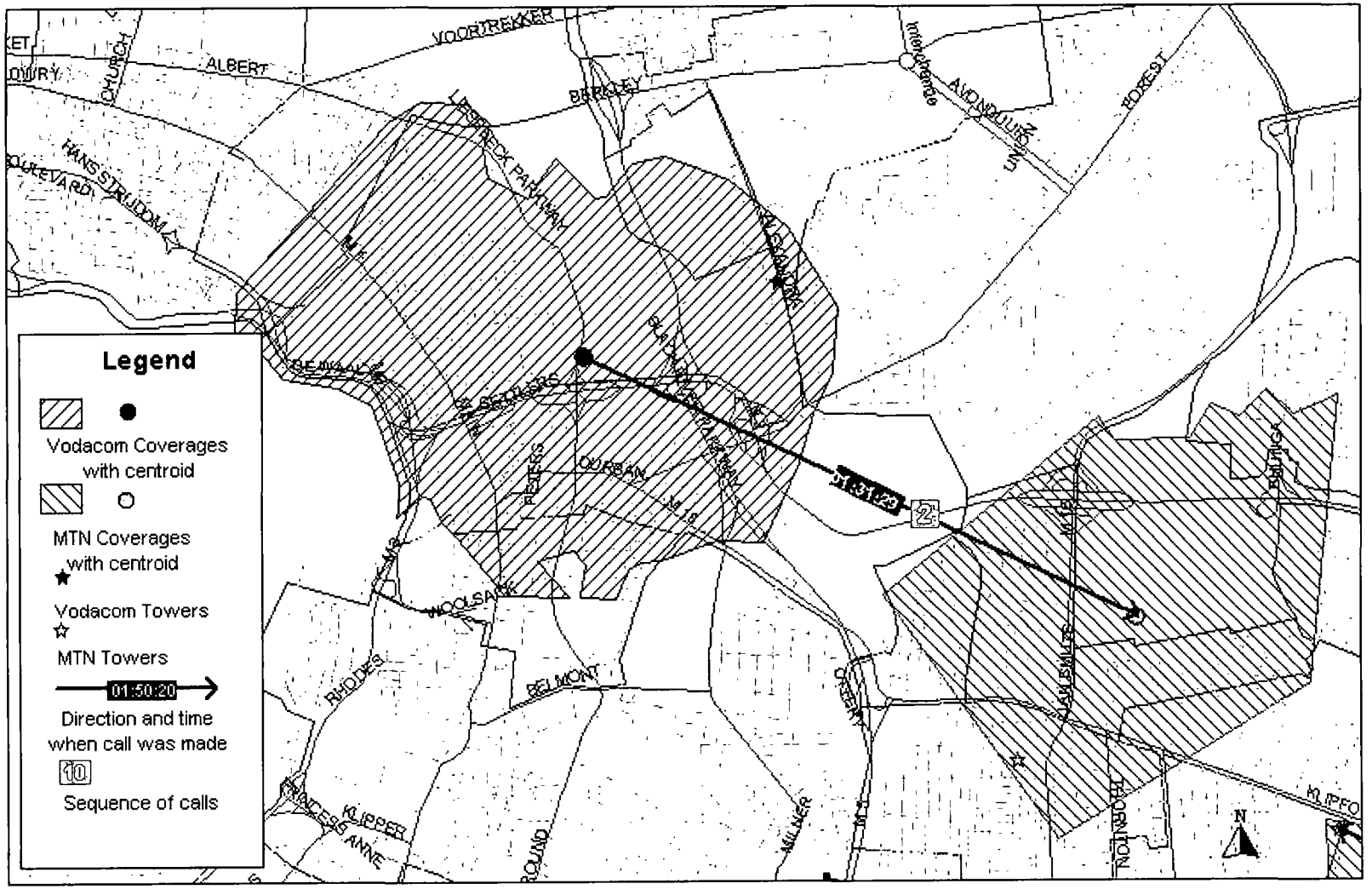
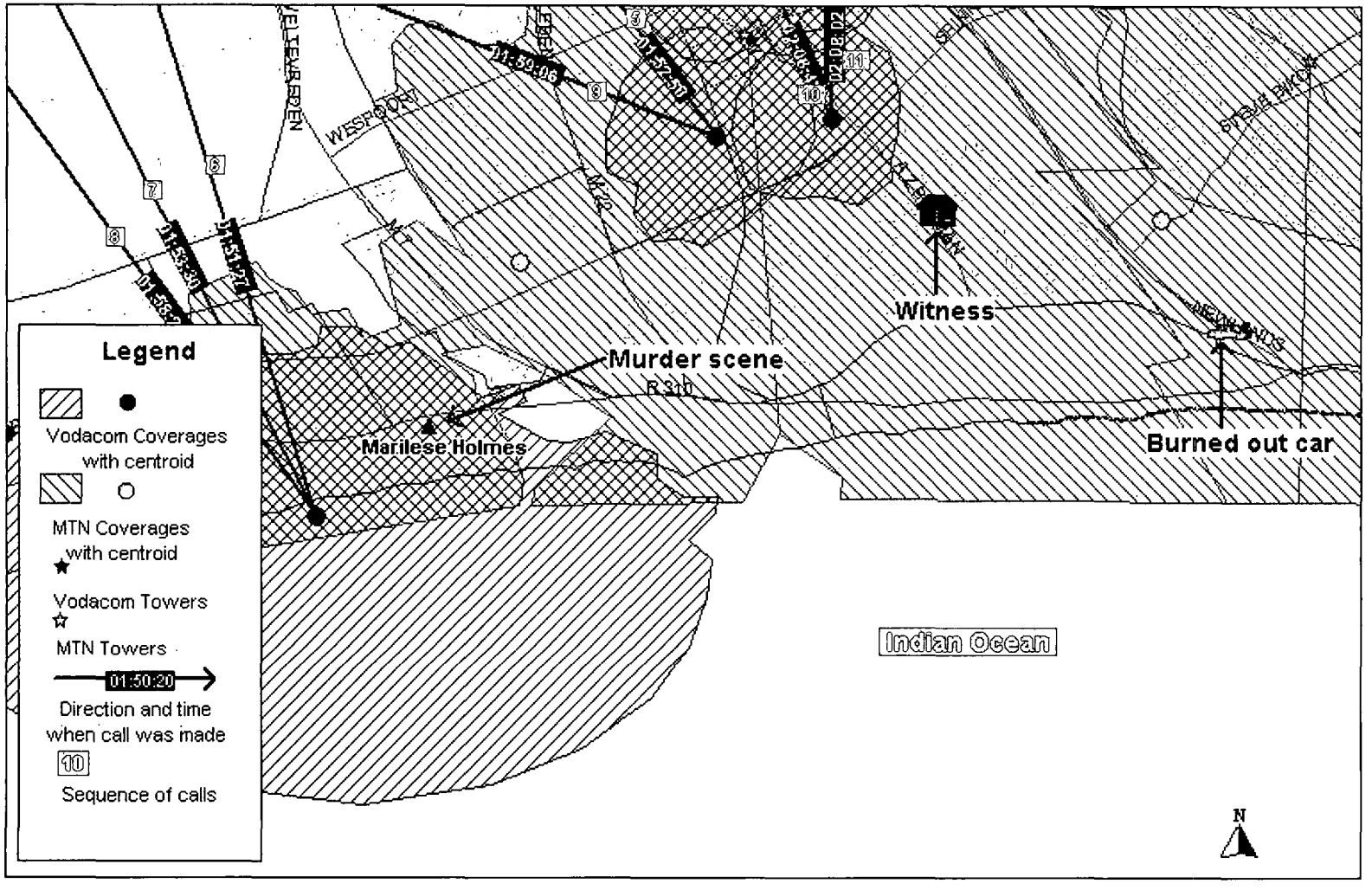


Figure 2
Links and Sequences of Calls Made by the Suspects

Figure 3
Locations of Suspects, Witnesses and Crime Scenes



RESULTS

The prosecutor used the map of the first hijacking to show the court that the accused, who were in possession of one of the cell phones, were in the immediate vicinity of the place where the victims' bodies were found when the call was received from a public phone—not outside the area, as one of the accused alleged during the trial. In this way, the map was used to break the alibi of one of the accused.

With regard to the third hijacking, the prosecutor used the map in court to present the sequence of events from the hijacking through the period immediately following the murders. He showed how the telephone calls could be used to track the movement of the two vehicles involved in the incident, including how they became separated at one point (by about 20 kilometers). This is illustrated in Figure 1, where the long arrows represent calls made in quick succession to organize a rendezvous. The map was also used to corroborate the evidence of a state witness who testified that she had seen the four attackers in the hijacked vehicle at a certain time that night and that they had the victims' cell phone in their possession. The prosecutor was also able to demonstrate that a number of calls were made from the victims' cell phone in the immediate vicinity of the witness's home during the period she claimed she had seen them—thereby supporting the witness's testimony.

CONCLUSION

While the case is still pending judgment, the success of mapping can be measured by the fact that the state advocate who prosecuted the case gave a seminar on the map to his colleagues. The prosecutor's seminar demonstrated that the use of the map in support of the prosecution was a powerful and persuasive device. Subsequently, another prosecutor has contacted CSIR to map data for a case involving two murders in which cell phones were also used during the commission of the crimes.

About the Authors

Peter Schmitz is a GIS specialist in CSIR's Division of Information and Communications Technology (also known as MIKOMTEK) in Pretoria. His main activities include crime mapping and analysis, mapping potential areas for growing essential oil plants in South Africa and providing clutter data for cellular telephone coverage planning. Schmitz holds bachelor's degrees in Geography and Mathematics from Rand Afrikaans University and a master's in Geography from the University of Durban-Westville. He is pursuing doctoral research on essential oil plants and is a member of the executive committee of the Association for Geographic Information of Southern Africa.

Antony Cooper is a GIS consultant for MIKOMTEK. Recently, he has been involved in projects related to crime mapping and analysis, standards for GIS and mapping the distribution of fatal and nonfatal nonnatural injuries. He has bachelor's degrees in Information Processing and Computer Science from Rhodes University, a Management Development Programme (Marketing Management) from UNISA and a master's degree in Computer Science from the University of Pretoria. Cooper has represented South Africa on two Commissions of the International Cartographic Association (ICI), co-chairs an ICA Working Group and is active in ISO/TC 211 Geographic Information/Geomatics. Effective April 2000, Cooper will become one of the first two Divisional Fellows in MIKOMTEK.

Andrew Davidson has been with the South Africa Police Service since 1981, serving as a detective inspector at the Peninsula Murder and Robbery Unit since 1992. His investigations include murder, armed robberies and serial murder cases.

Kevin Rossouw joined the Department of Justice in May 1981. He holds bachelor's and master's degrees in law from the University of Stellenbosch and was authorized to practice as an advocate of the High Court of South Africa in November 1986. Roussow was appointed a prosecutor to the Regional Court of Cape Town in August 1987 and was later appointed Regional Court Control Prosecutor of Cape Town. In March 1989, he was appointed a State Advocate to the Office of the Director of Public Prosecutions of the division of the Cape of Good Hope in Cape Town and has been a Senior State Advocate in that office since 1991.

Apprehending Violent Robbers Through a Crime Series Analysis

Christine A. Robbin
Seattle Police Department

IDENTIFICATION

In early November 1998, Seattle began to experience a rash of violent robberies. During their routine scanning of all incoming police incident reports, Detectives Jackie McClanahan and Christi Robbin (both assigned to the Seattle Police Department's Crime Analysis Unit) identified several robberies that appeared to be similar. A more detailed examination of the incidents showed that two Black male suspects, 20 to 30 years of age, were involved in each incident. These suspects wore Halloween masks or bandannas to hide their faces, dark clothing and gloves. They were armed with automatic weapons and targeted small businesses with employees who were alone at or near closing time. The employees were tied up or locked inside storage areas of the businesses, and the suspects always took money. The suspects used stolen minivans or small pickup trucks for transportation to and from the robberies. Because of the similarities, the detectives believed that the series of robberies was being committed by the same suspects.

ANALYSIS

Detective McClanahan created a Microsoft Excel spreadsheet with each incident's case number, date, time, exact address, type of business, suspect descriptions, MO, weapons and items taken. Detective McClanahan then exported this spreadsheet to ArcView in DBF format. She geocoded the robbery addresses to create a point theme in a new shapefile. After creating the map, Detective McClanahan used methods from Steven Gottlieb's book *Crime Analysis: From First Report to Final Arrest* and its study guide to predict the date, time and area of the next robbery.[1] Detective Robbin conducted an identical analysis for the theft and recovery of each vehicle used in each robbery (see Figure 1).

[1] Since this time, the Seattle Police Department Crime Analysis Unit has replaced the hand calculations that Gottleib describes in his book (and that were used for this project) with a tool based on code from the Spatial Crime Analysis System (SCAS) developed by U.S. Department of Justice GIS staff. The original SCAS Standard Deviation Ellipse tool creates first, second and third standard deviational ellipses of the spatial distribution of point themes; the modified tool creates ellipses as an ArcView theme and displays the distribution percentage for each ellipse. The SCAS tool was used to create the included figures.

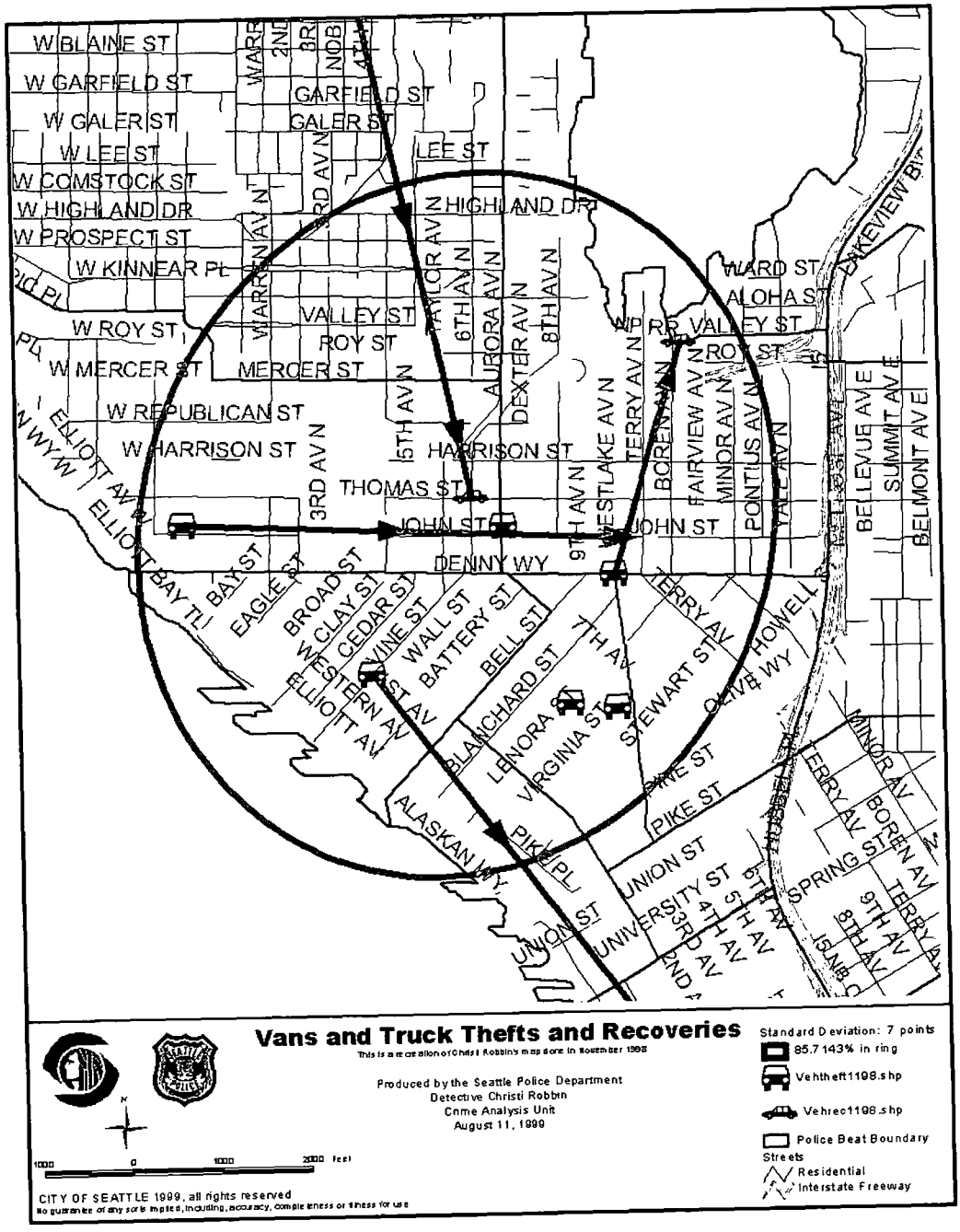


Figure 1
Vans and Truck Thefts and Recoveries

Results of the crime analysis were combined to form a Crime Series Alert. The face sheet of the alert contained information relating to the consistencies of the incidents, descriptions of the suspects and their MO, and predictions of the date and time the next robbery would occur. A second map attached to the alert included the locations of past robberies and the standard deviational area in which the robbers were predicted to strike next (see Figure 2).

Once completed, the alert and map were distributed to all Seattle officers, detectives, crime prevention personnel, media relations personnel and adjoining agencies. The bulletin was so widely distributed to allow unit commanders to plan a three-pronged coordinated response to the crime series: prevention of further incidents, apprehension of the suspects and successful prosecution of the suspects.

Feedback Loop

Another robbery occurred on November 15, 1998. The suspects did not strike within the date frame predicted (November 9 to 13); however, their robbery was within the predicted area and the predicted time frame. The MO, suspect descriptions, suspect behavior and type of business targeted were also the same. Detectives McClanahan and Robbin used the additional incident information to recalculate their predictions for the suspects' likely date, time and area of next strike. They predicted that the suspects would strike again between November 17 and November 22, between 10:00 P.M. and12:45 A.M. An updated Crime Series Alert was created and distributed.

The next robbery took place on November 17, 1998. This was within the time frame predicted; however, the robbery was just outside the predicted area. More calculations were conducted with this additional information, and another updated Crime Series Alert was issued.

Response Plans

Most of the robberies had occurred in the North Precinct. Officers in the North Precinct used Detective McClanahan's robbery maps and predictions in conjunction with Detective Robbin's vehicle crime maps and predictions to establish a tactical plan.

Working closely with Detectives McClanahan and Robbin, Robbery Detective Ken Hicks used the maps to chart the suspects' movements and to confirm that the auto thefts and robberies were related. Detective Hicks also established that all the robberies involved both suspects; one did not rob without the other.

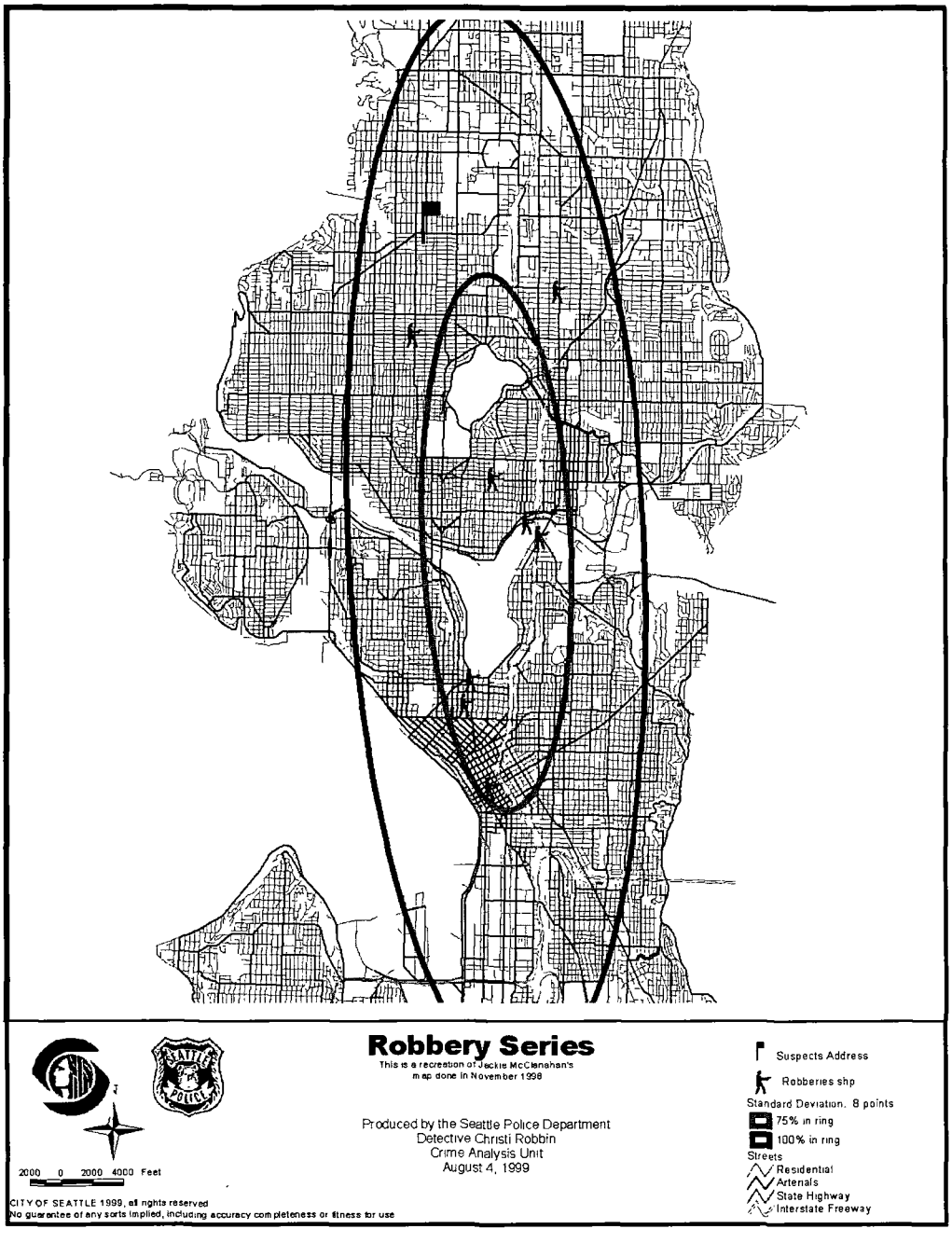


Figure 2
Robbery Series and Predicted Areas of Future Incidents

Besides the Crime Series Alert (with a small map), maps were plotted in poster size and placed on the wall in each precinct roll-call room. The maps made it easier for officers to see the relationship between the auto thefts and the robberies. Both the auto thefts and the robberies occurred close to Interstate 5, one of the main freeways.

Guiding their actions by the analysts' predictions, robbery detectives coordinated with patrol commanders and SWAT to increase patrols and stakeouts of potential target businesses. No additional robberies occurred between the issuance of the November 17 updated Crime Alert and the suspects' arrest.

Informing the Public

The Seattle Police Department's local access television show, *Beyond the Badge,* often airs information about hot issues within the city. This robbery series was publicized on *Beyond the Badge* to alert the public and show areas at risk of victimization. Included in the public information were crime prevention tips for small businesses and vehicle owners, since these were the suspects' main targets.

The robbery series was given additional coverage by network television and the newspaper media. The department's media relations staff used the Crime Series Alerts to formulate press releases and to keep informed of developments in the case.

The Arrest

On December 29, officers received information from a confidential informant about the location of the two possible suspects,[2] who were reported to be driving a stolen Nissan Pathfinder. Patrol officers and SWAT staked out the targeted house and witnessed the two suspects driving off in the stolen Pathfinder. SWAT attempted to stop the vehicle by blocking it with a police car. The suspects rammed their way through the stop, fled in the car until striking a telephone pole and then ran away. A canine unit was on the scene and tracked the suspects with SWAT. They were both finally arrested without further incident.

[2] Coincidentally, the location of the suspects was also in the predicted area for the next robbery.

After the arrest, Detective Hicks used the maps and predictions made by Detectives McClanahan and Robbin to back-chart the suspects' activity. This technique enabled him to identify a home invasion robbery during which weapons were stolen and later used in the robberies. This crime had originally been discovered by Detective McClanahan, but she had not included it in the series because of the slightly different MO. In addition, Detective Hicks identified two more robberies in the predicted area and was able to associate stolen vehicles with them.

OUTCOME

One suspect pled guilty; as of this writing, the other is expected to plead guilty shortly. Both suspects' pleas are to three counts; however, the department was able to clear up all of the robbery cases attributed to them with their statements.

Officers were able to track and successfully arrest these suspects because mapping facilitated the sharing of information and helped identify the connection between the robberies and auto thefts. Detective Hicks also found the maps and predictions to be very helpful in supporting his post-arrest case.

Reference

Gottlieb, S., S. Arenberg and R. Singh. 1998. *Crime Analysis: From First Report to Final Arrest.* Montclair, CA: Alpha Publishing.

About the Author

Christine A. Robbin has been with the Seattle Police Department since August 1987, first as a patrol officer and more recently as a community police team officer, foot beat officer and crime analysis detective (her current position). Robbin was Community Police Team Officer of the Year for 1994 and was nominated for Officer of the Year in 1996.

Predicting a Residential Break-In Pattern

John Warden and Jerry Shaw
Edmonton (Alberta, Canada) Police Service

BACKGROUND

Edmonton (Alberta, Canada) Police Service's Crime Analysis Section began crime mapping in January 1998. Analysts use MapInfo 4.1 to produce hard-copy pin maps twice per week. Monday morning's map captures data from the previous Thursday, Friday, Saturday and Sunday; Thursday morning's map captures data from Monday through Wednesday.

Analysts approach the mapping process strategically, producing pin maps of the city's Divisions (each a quarter of Edmonton) to show what is happening over a large area of the city. Analysis at this high level lets police identify concentrations of crime and emerging crime problems. Data reports showing address, date, time, file number, police district number and neighborhood are attached to each map. The data reports are sorted in ascending order by time/date.

Following the overall strategic mapping, Edmonton analysts then produce maps depicting obvious concentrations and clusters of crime at the district or neighborhood level. Monthly thematic pin maps, broken out by week, show how specific crimes at the Divisional level have evolved. Color crime maps are disseminated by same-day interdepartmental mail service to the Division Superintendent for strategic planning and the Division Criminal Investigations Section Staff Sergeant for tactical planning and personnel deployment. Black-and-white photocopies of the crime maps are included in the Police Service Daily Bulletin for distribution servicewide, usually the following day.

PROBLEM IDENTIFICATION

In November 1998, Constable Jerry Shaw (the Crime Analysis Section's Crime Mapping Specialist) observed break-and-enter crime clusters occurring within a specific area of the North Division. The problem area was identified, and Tactical Crime Hot Spot maps were created and forwarded to the Criminal Investigation Section Staff Sergeant for that Division.

As shown by the following maps, the crime clusters were self-evident and, compared to previous crime maps of the same area, revealed a marked

increase in activity. The geographic area in question is primarily an older residential area (see Figure 1).

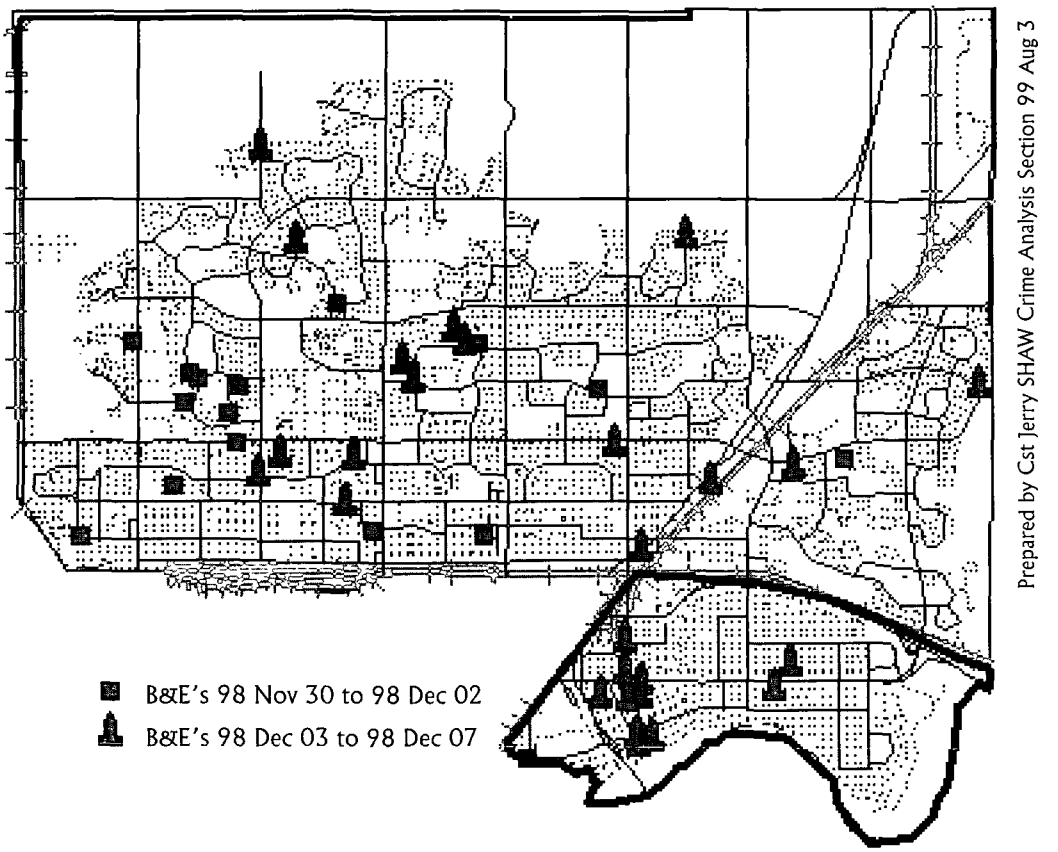
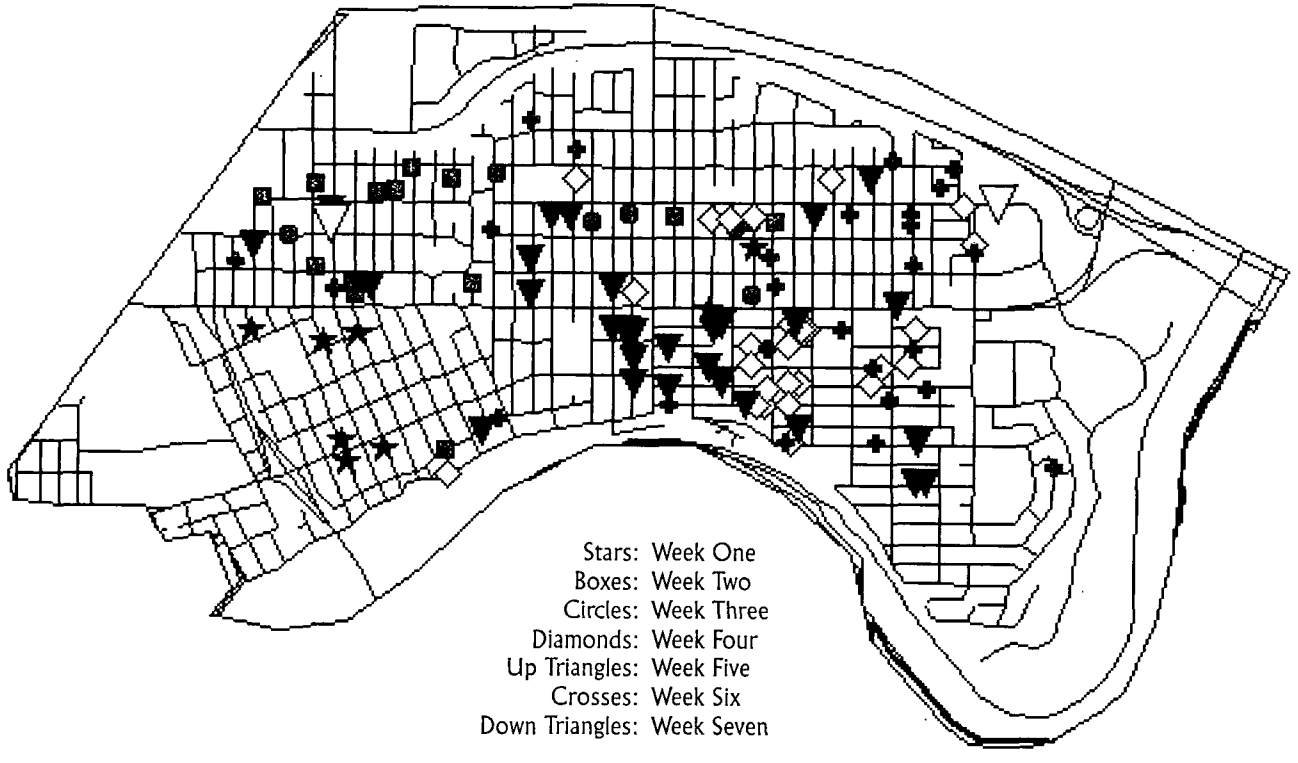


Figure 1
Break-and-Enters for North Division
From 12:01 A.M. 98 Nov 30 to 12:00 A.M. 98 Dec 07

PROBLEM SOLVING

Crime mapping showed where the suspects were operating and depicted the evolving pattern of their movement (see Figure 2). Time/date sequencing of 240 break-ins in the hot-spot area revealed that these were daytime break-and-enters. Analysts also noted that the method of entry was similar in each case: Either a window next to the door lock was broken, or the door itself was pried open. A comparison of method of entry for each incident tied the suspects to specific break-ins.

Figure 2
Break-and-Enter Hot Spots
From 12:01 A.M. 98 Nov 30 to 12:00 A.M. 99 Jan 24 (Weeks 1 Through 7)



Prepared by Cst Jerry SHAW Crime Analysis Section 99 Aug 3

The above analyses were collected in a Microsoft Excel spreadsheet to show time/date/location and method of entry. (Figure 3 has been modified for protection of privacy so that addresses are shown as the "hundred" block rather than as exact locations.)

Predictive Tool

Based on the cluster movement over time and space, Constable Shaw was able to predict the approximate area in which the suspects would next operate. ("The human brain after all, remains the most powerful pattern recognition engine available."[1]) This provided investigators a geographic starting point in which to place surveillance teams.

Results

As a result of the excellent investigative work in combination with the crime maps, tactical analysis and pattern prediction, investigators were able to set up surveillance in the area of highest probability. Two suspects were soon apprehended while engaged in a residential break-in and taken into custody.

The investigation, supported by the tactical analysis, was able to link the two accused conclusively to more than 123 residential house break-ins, of which

- 77 were cleared by victims identifying their stolen property;
- 27 were cleared by "recent possession," i.e., pawned property; and
- the remaining 43 were cleared on the basis of the similar fact analysis.

More than $500,000 worth of property was stolen in these break-ins. Property valued at $70,000 was recovered.

In preparation for trial, the tactical hot-spot crime maps and the Excel chart were printed on E size (34-by-44-inch) paper using a Hewlett-Packard DesignJet 750C Plus Color Plotter.

The two accused pled guilty at trial; each was sentenced to nearly eight years in prison.

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[1] Brantingham, P.L. and P.J. Brantingham. 1999. *Studies on Crime and Crime Prevention.* Vol. 8, no. 1. Scandinavian University Press, for the National Swedish Council for Crime Prevention.

Figure 3
Sample Microsoft Excel Spreadsheet of Break-Ins

Microsoft Excel Viewer - CMRC Attachment.xls

File Edit View Window Help

	A	B	C	D	E	F	G
1	PROPERTY IDENTIFIED	SIMILAR FACT	DATE	ADDRESS	TIME	ENTRY METHOD	MATCHED M.O.
2	Yes		98 Oct 30	12100 106 St	1600-2130	Forced door	Yes
3		Yes	98 Nov 02	11400 68 St	1530-2030	Forced door	Yes
4	Yes		98 Nov 02	11300 67 St	1730-2200	Forced window	Yes
5	Yes		98 Nov 04	12200 102 St	N/K	Forced window	Yes
6	Yes		98 Nov 08	11900 83 St	1445-1730	N/K	Yes
7	Yes		98 Nov 08-11	11400 67 St	1600-1500	Forced door	Yes
8	Yes		98 Nov 09	11900 86 St	1930-2130	Forced pried	Yes
9	Yes		98 Nov 10-12	11900 101 St	1030-1700	Forced window	Yes
10		Yes	98 Nov 11	11300 64 St	1330-1800	Door window	Yes
11		Yes	98 Nov 12	7500 112 Av	0850-1925	Forced window	Yes
12	Yes		98 Nov 12	11500 86 St	1900-2300	Forced door	Yes
13		Yes	98 Nov 13	11100 63 St	1830-1900	Door open	Yes
14		Yes	98 Nov 13	11500 68 St	0700 1600	Forced door	Yes
15	Yes		98 Nov 13	11400 65 St	1700-2210	Forced pried	Yes
16		Yes	98 Nov 14	11700 85 St	1300-1605	Forced door	Yes
17	Yes		98 Nov 16	11800 68 St	0720-1525	Forced pried	Yes
18		Yes	98 Nov 16	11100 69 St	1155-1730	Forced door	Yes
19	Yes		98 Nov 17	12200 79 St	1100-2300	Forced pried	Yes
20	Yes		98 Nov 19-20	12000 61 St	1600-0035	Forced window	Yes
21		Yes	98 Nov 19-23	12100 65 St	1800-1806	Forced door	Yes
22	Yes		98 Nov 20	12000 62 St	2000-2030	Forced window	Yes

Sheet1 Sheet2 Sheet3

Ready NUM

Building on Our Processes

To be more timely and effective in its crime map dissemination, Edmonton Police Service is converting its crime maps to JPEG files and displaying them on its Crime Analysis Section Intranet Web Page, which is accessible servicewide via our wide-area network. The department is in the research phase of an enterprisewide Web mapping application that would serve the strategic and tactical needs of officers, the community and police executives.

Conclusion

Crime mapping identified a crime hot spot and tracked this hot spot as it developed into a significant crime problem. The crime mapping analysts, working in partnership with the investigators, developed a tactical solution that solved the problem with measurable results. This is a simple but excellent example of effective intelligence-led policing.

About the Authors

John Warden is a sergeant with the Edmonton (Alberta, Canada) Police Service. He has an extensive background in criminal intelligence and for the last two years has been the supervisor of the Crime Analysis Section, which comprises 10 crime analysts, one crime mapping specialist and two civilian support staff. In early 1998, Warden established the crime-mapping program for the Edmonton Police Service. This program is currently evolving from a single desktop application to an enterprisewide Web application. Warden is also researching a crime-mapping continuum for an intelligence-led policing process. He welcomes any comments or suggestions on either of these issues at john.warden@police.edmonton.ab.ca.

Jerry Shaw has been with the Edmonton (Alberta, Canada) Police Service for 20 years and has an extensive background in community policing. His experience using actual pin maps in his community station led to his transfer to the Crime Analysis Section in September 1998. Using MapInfo, Constable Shaw produces more than 2,000 hard-copy crime maps each year.

Improving Law Enforcement and Criminal Justice Operations

Optimizing Closed-Circuit Television Use

Spencer Chainey
London Borough of Hackney

INTRODUCTION

Closed-Circuit Television (CCTV) has become one of the main tools for preventing, detecting and deterring street crime and disorder in many of the United Kingdom's urban centers. CCTV also plays an important role in crowd control (e.g., street demonstrations, football match crowds), the prevention of vandalism in isolated areas (e.g., parks, cemeteries, coastal resort promenades) and antiterrorism efforts. As demand for CCTV use against crime and disorder has increased, so has the need for better ways of selecting target areas and cost-effective means for measuring its effect. The use of GIS for managing and mapping crime and disorder data is seen as one of the best methods for helping this targeting and monitoring process (Hough and Tilley 1998).

This case study focuses on how the London Borough of Hackney (Hackney Council) is developing the use of GIS for crime and disorder mapping and analysis to assist its CCTV strategy. The case study shows how Hackney is using GIS to help prioritize sites for CCTV, optimize camera coverages, depict camera lines of sight and monitor the effect of CCTV coverage on local crime patterns. Survey results are presented that link CCTV use to reductions in the fear of crime. Further examples of CCTV's impact on crime are drawn from UK studies investigating its use.

PRIORITIZING SITES FOR CCTV

GIS offers a great potential for prioritizing CCTV locations. With the use of detailed crime hot-spot maps (see Figure 1), GIS can identify and rank hot spots by their crime density. This information can then be used to target CCTV installation sites. The reality, however, is often less sophisticated. Street CCTV systems are generally located in areas that experience the highest volume of crime. These tend to be in urban town centers that have a high public attraction due to the concentration of shopping facilities, transport terminals, leisure facilities, pubs, bars and nightclubs.

Crime hot-spot maps of Hackney reveal its two main town centers (Hackney and Dalston Kingsland) as the clear areas of highest street and business crime and disorder. These two areas were the first chosen for CCTV coverage in 1997. The choice required very little GIS input because the markedly high volume of crime in these two areas was well known. A crime hot-spot map in this case merely confirmed general knowledge. This decision-making process is similar in other areas of the UK, where the top two or three crime hot spots are often well known. As CCTV has become more widespread—now covering the majority of London's main town centers—local community safety partnerships (namely the local police division and local government) are aiming to install CCTV in their smaller town centers or in areas recognized as high-crime social housing estates. A local hot-spot ranking system is becoming more of a necessity to target areas where CCTV will have the greatest impact in reducing local crime and disorder.

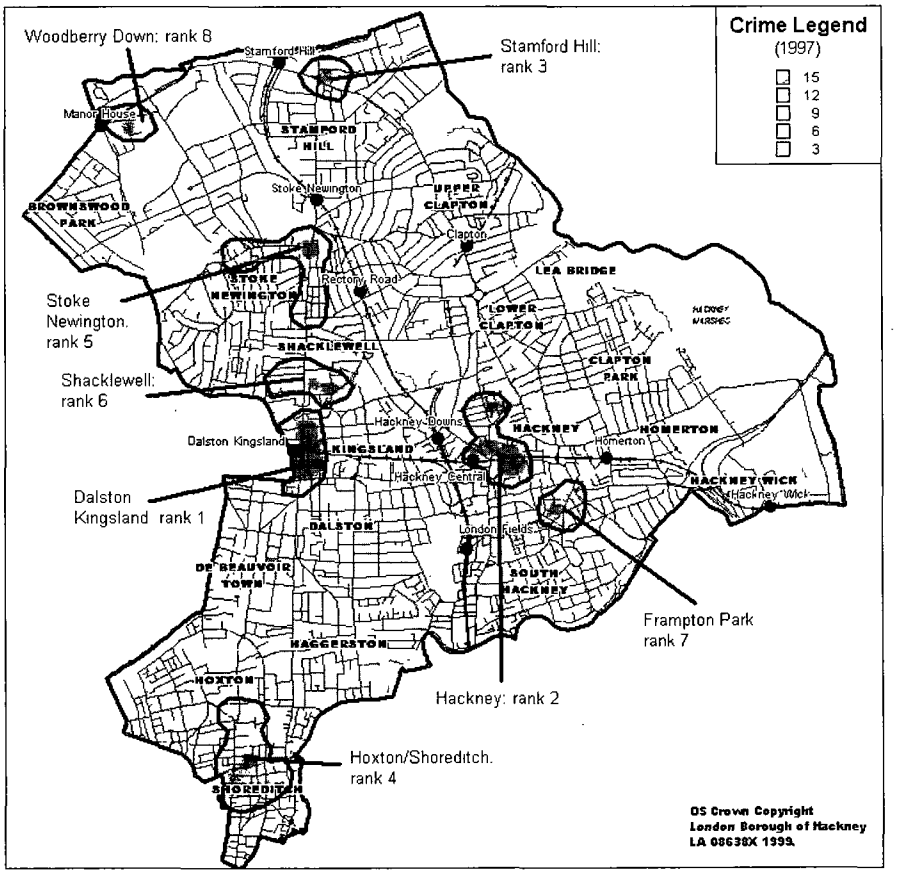


Figure 1
Targeting Sites for CCTV in Hackney
Hot-spot maps of crime and disorder can be used to help identify and rank priority areas for CCTV.

Hackney's CCTV strategy recognizes this need to rank hot spots. In the UK, installation of street CCTV is generally funded by the Home Office. Local community safety partnerships are invited to bid for funds approximately every two years and, if successful, require local match funding. Hackney's ranking process uses GIS to identify local crime and disorder hot spots. The maps show the general distribution of crime across each hot-spot area, from which a crime profile describing the type and nature of each hot spot can be generated. This process has only recently been introduced in Hackney, but its aim is to make the community safety partnership more successful in bids for CCTV funding.

Optimizing Camera Locations

GIS also helps determine optimal CCTV camera locations in Hackney. Previously, engineers contracted for CCTV camera installation would locate cameras based on a site visit and paper street plans, not taking into account other important issues. This method may have overlooked potential obstacles to view not highlighted on the paper map (e.g., lampposts, street signs, tree foliage), local planning constraints (e.g., a pole-mounted camera in an area where it could peer into a local resident's property), proposed new developments that may affect future crime patterns (e.g., new retail outlets, bars or nightclubs) and "hotpoints" (points of significant high crime concentration within a larger area that is itself a crime hot spot). Decisions on locating CCTV cameras now use detailed crime hot-spot maps and local crime profiles of targeted areas. This presents Hackney's CCTV site designers with more options for camera location and potential coverage. GIS can also measure area camera coverage to help plan the minimum number of cameras for the maximum required view. For example, replacing 11 cameras with 10 cameras in more optimal locations offers immediate savings of one camera (approximately $20,000).

Mapping CCTV Coverage

CCTV surveillance officers and local police officers require detailed maps showing individual CCTV camera locations and the areas they cover. These are an important reference for relating local crime and disorder events to

any incriminating evidence that is captured. Images captured on a CCTV camera can generally be grouped into three different categories, related to the image height of a standing man who is 1.6 meters (5.25 feet) tall. When the image fills the screen vertically, the image height is said to be 100%R (Aldridge 1997). The three coverage categories are

- Detection coverage: not less than 10%R
- Recognition coverage: not less than 50%R
- Identification coverage: not less than 120%R

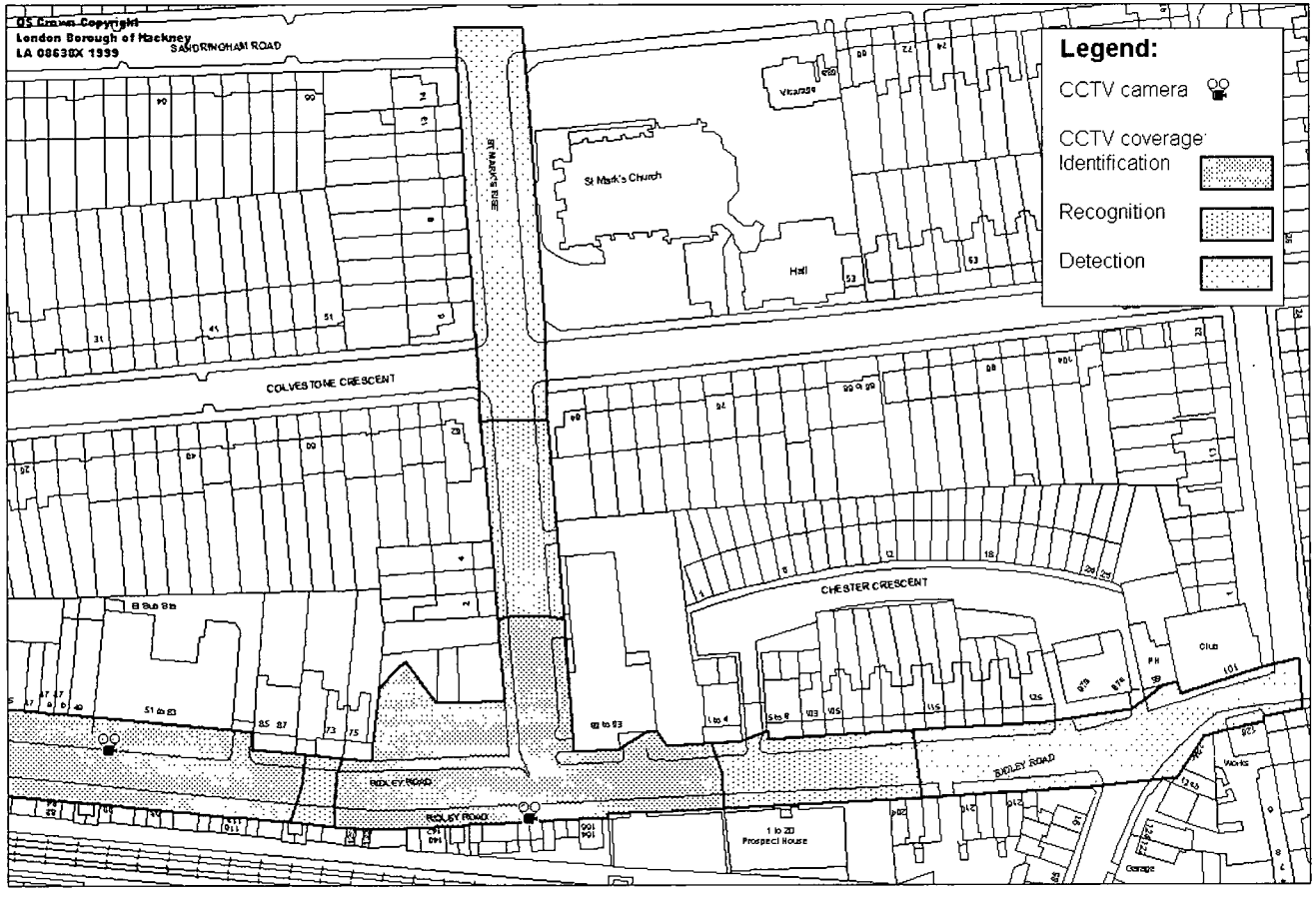
Figure 2 is a mapped CCTV camera coverage plan. The map shows the location of the camera and the three different coverage descriptions. These can be drawn as buffers radiating from the camera location, where their extent in relation to R is a function of the camera's lens strength and focal length. In this example, the identification, recognition and detection coverages are defined by 50-meter, 100-meter and 200-meter buffers respectively. Buffer creation is a simple GIS operation; with digital street and building plans, detailed and accurate camera coverage maps can be easily produced. These maps also benefited from 25-centimeter resolution digital aerial photos (acting as backdrops to the cartographic vector maps) to help identify buildings and other obstacles to each camera view.

MONITORING THE EFFECT OF CCTV

As seen in Figure 2, the view of a CCTV camera can be relatively small. Therefore, if we are to monitor the effect that CCTV cameras have on crime and disorder in the areas they cover, we need to have available data that is accurate and precise to the location of the event. Prior to Hackney's implementation of GIS and its current partnership sharing crime and disorder information, statistics describing crime and disorder events within CCTV coverage areas required a text-based database search. For example, if a camera was judged to cover the properties between 1 to 20 High Street, a text search of each of these addresses was required for collating these statistical reports. This method is very time-consuming and is entirely successful only when all event address records have been entered without any spelling mistakes and in full.

The use of GIS and geocoding software has helped Hackney develop a comprehensive and highly accurate database of geocoded crime and disorder events (Chainey 1999). This database is available at two levels of precision based on ownership and data-protection laws. Where the data user is

Figure 2
CCTV Camera Coverage Plan



from an organization that is not first party to ownership of the data, only events geocoded to postcode precision (the centroid of approximately 20 properties) are available. Data owners can geocode and store property/individual location events (where the original address information or software systems in place are effective enough to return data of sufficient quality to map to these precise locations). In an information-sharing partnership such as Hackney's, with a need to use property precision data for certain types of analysis, results using this precise data can be shared across the partnership as long as they are of an aggregated nature and cannot be traced back to an individual person or property location. This type of collaboration is often required for accurate CCTV monitoring. CCTV camera coverage frequently does not conform to postcode areas. Therefore, the location to which the sanitized postcode precision version of the record is geocoded can be outside the CCTV coverage, even though the original event occurred within the CCTV coverage (see Figure 3). Property precision data is therefore required to accurately monitor the change in crime of the area covered by CCTV.

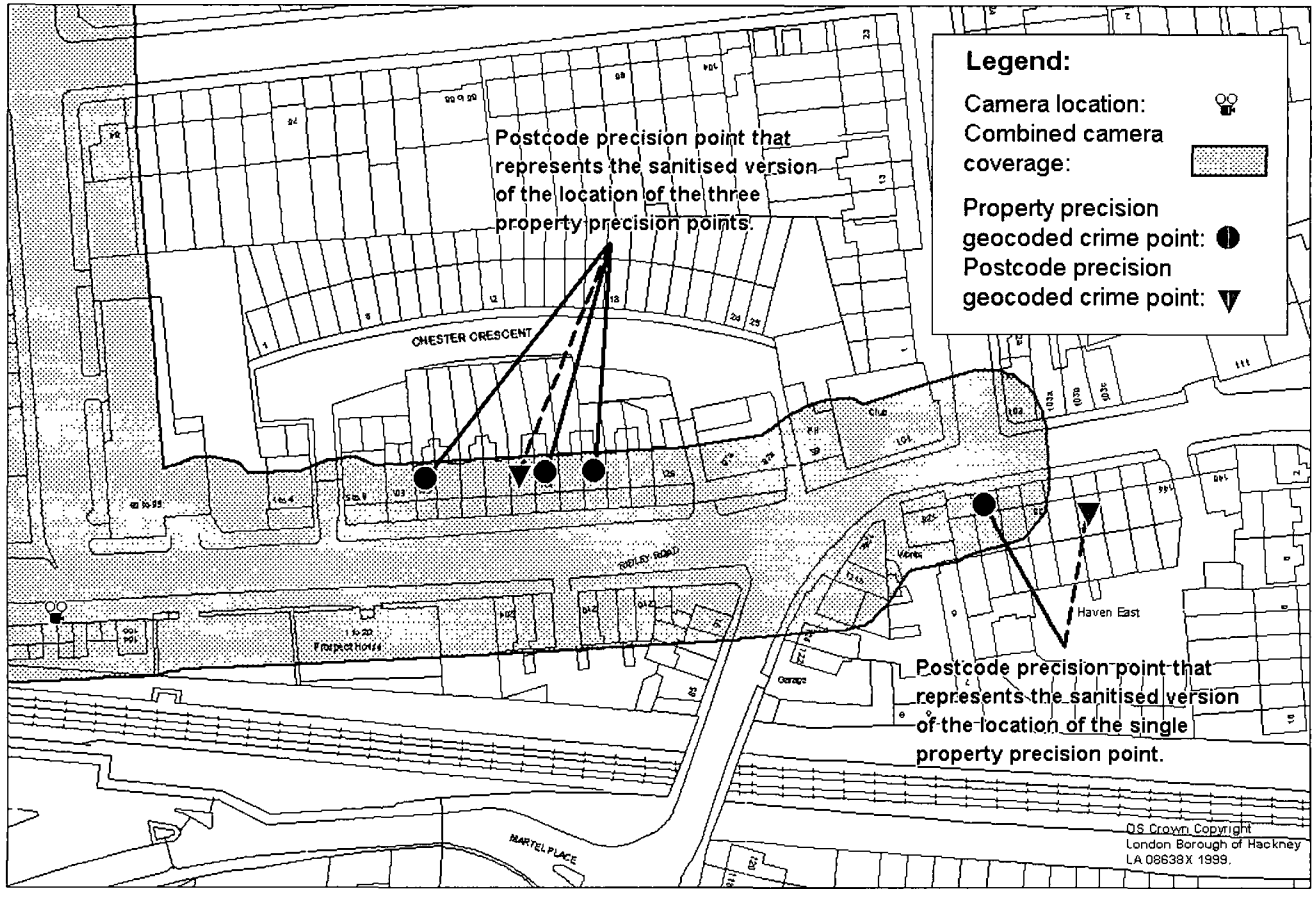
In addition, the manner in which crime and disorder events are geocoded must be noted to adopt or make adjustments to the GIS analytical processes. In the UK, for example, crime and disorder events are geocoded to the center point of the building to which they relate. The edges of the mapped CCTV camera coverages go up to the outline of the buildings (as shown in Figure 2). Coverage areas are modified by extending their limits to the points to which crime and disorder events are geocoded when performing monitoring analysis (see Figure 3). This often requires only the creation of a buffer that is large enough to extend the original CCTV coverages to these geocoded locations. From this stage, simple point-in-polygon processes can be performed to count by selected crime type and time periods.

Hackney uses defined "displacement zones" to monitor the changing crime and disorder spatial patterns that may result from CCTV installation. Hackney employs two types of displacement zones:

- Neighboring displacement zones. These cover the area immediately outside the CCTV camera coverage, often regarded as the fringe of the central business district.
- Zones having similar town center/opportunity characteristics to the area covered by CCTV. These are set up to monitor potential crime displacement to areas not covered by CCTV but that present similar opportunities to offend (e.g., where there is a concentration of retail outlets, pubs, bars and nightclubs).

Figure 3
Comparison of Property Precision and Postcode Precision Geocoding

The map shows the importance of using high-precision geocoded crime and disorder data for monitoring the effect of CCTV. If a sanitized postcode precision version of the event is used, it may not be captured by any count of points (crime events) in a polygon (CCTV coverage). The figure also shows the need to understand the location to which crime and disorder events are geocoded.



At present the boundaries of these zones rely upon empirical analysis of the extent of the central business district, natural physical barriers such as railway lines and historical distributions of crime. Hackney is investigating use of the Index of Town-Centredness (see http://www.casa.ucl.ac.uk/towncentres) to help capture these displacement boundaries, particularly where similar opportunities to offend are available and street CCTV is not installed.

Hackney also uses crime and disorder hot-spot maps as an effective method of displaying before-and-after CCTV installation patterns of crime. Such maps are a simple way to show whether local patterns of crime have reduced and whether any local displacement has occurred. Hot-spot maps of street robbery, business crime and vehicle crime are created each month for the borough's CCTV surveillance officers, providing an updated snapshot of current crime patterns and helping focus direction of CCTV camera surveillance.

EFFECTS OF CCTV

CCTV has been installed in Hackney's two main town centers since December 1997. The effect the cameras have had on reducing recorded crime and disorder is still somewhat mixed. The latest interim evaluation of CCTV in these areas was carried out for the eight months after installation. The target reduction in street robbery was exceeded in Dalston Kingsland (a reduction of 31.6%) but not in Hackney. There also appeared to be no apparent local displacement; instead, street robbery in the area immediately neighboring CCTV coverage dropped significantly. A significant reduction in street robbery (26%) was also experienced boroughwide. (Since these two town centers are the main hot spots for street robbery, any significant reduction in those areas has a pronounced effect on the boroughwide figure.) Reductions in street robbery were similar for both CCTV-covered regions and all other areas; therefore, the reductions monitored in the CCTV coverage and displacement zones may merely be part of a downward trend or a result of the combination of other boroughwide crime-prevention initiatives.

Significant reductions in recorded thefts of motor vehicles during the first eight months of CCTV use were recorded in both Dalston Kingsland (20.8%) and Hackney (33.3%). This was against a slight boroughwide increase of 0.04 percent. A comparison between areas covered by CCTV and those not covered suggests that CCTV's effect in reducing crime in these two main hot spots was merely to displace it to mostly neighboring areas.

Hackney has also recently completed a survey of residents and business owners in and around locations where CCTV has been installed. Ac-

cording to the survey, 82 percent of business owners agreed that CCTV helped them feel their business premises were safer; the general public further agreed (91%, with 61% agreeing strongly) that the presence of CCTV helped reduce their fear of crime.

I Spy With My Little Eye

Something Beginning with G

Evident from all recent studies has been the role of desktop mapping and GIS in monitoring the effects of CCTV use against street crime and disorder. From Hackney's experience, the use of CCTV has coincided with a reduction in crime and disorder—albeit with displacement to adjacent areas. For CCTV to be used to its full capacity, great importance is placed in a clearly thought-out strategy. This includes ranking zones for priority for CCTV installation, appreciating the ways in which CCTV can help reduce crime (especially through collaboration with the local community), setting realistic targets for crime and disorder reduction, understanding methods for monitoring and evaluation and obtaining funds for system improvement. Spatial displacement is often considered in monitoring, but an appreciation of displacement to other crime types is also required. Accurate and precise geocoded crime data is a necessity for effective monitoring of CCTV's impact. When a GIS solution replaced the text-based database search originally employed for querying crime events in CCTV areas in Hackney, results showed that the level of crime was less than originally shown.

Conclusion

CCTV is having great impact in many of the UK's urban centers as a tool to help prevent crime and disorder. Its use is reducing fear of crime and—though its impact on reducing crime is a little more complex—playing a key role in combating crime and disorder in high-crime town centers.

The use of GIS and crime mapping helps Hackney prepare more competitive bids for funding CCTV installation by setting out a clear strategy for aerial adoption. The implementation of a GIS crime-mapping solution in Hackney plays an increasingly important role in helping the borough use CCTV effectively and meet its targets for reducing crime, disorder and the fear of crime.

REFERENCES

Aldridge, J. 1997. *CCTV Operational Requirements Manual.* Version 3, PSDB Publication Number 17/94. Police Scientific Development Branch, Home Office.

Chainey, S.P. n.d. "Combating Crime Through Partnership." In *Mapping and Analysing Crime Data: Lessons from Research and Practice,* edited by A. Hirschfield and K. Bowers. London, England: K. Taylor and Francis. In press.

Hough, M and N. Tilley. 1998. *Getting the Grease to the Squeak: Research Lessons for Crime Prevention.* Police Research Group Crime Detection and Prevention Series Paper 85. London, England: Home Office Police Research Group.

ABOUT THE AUTHOR

Spencer Chainey is Corporate Geographical Information Systems Manager for the London Borough of Hackney. He has led the award-winning Brent Crime Mapping Project and chairs the Association for Geographic Information's Crime and Disorder Special Interest Group. Chainey works closely with London's Metropolitan Police Force on crime mapping research and its practical applications; he also is a chief adviser and trainer in GIS for crime pattern analysis, geographical information management and information sharing. His work has been recognized as an example of best practice by Scotland Yard, the British Home Office, the Government Office for London and the Audit Commission (the UK's monitor of the best use of public money). As well as developing GIS applications for crime mapping, Chainey coordinates applications for mapping social exclusion, housing estate management, strategic planning for urban regeneration and Internet GIS solutions. He has a bachelor's degree in Geography from Kingston University and a master's degree in GIS from the University of Edinburgh.

Cracking Down on Gangs with GIS

Aaron C. Otto, Ken W. Maly and Don Schismenos
Akron, Ohio, Police Department

Introduction

Ohio has recently enacted a gang statute in an effort to curb gang violence and activity. The law, "Participating in a Criminal Gang," defines criminal gangs, gang activity and the circumstances in which a law enforcement officer can charge an individual for gang-related illegal activity. These circumstances include committing certain felonies and other specific crimes while being a member of a gang. The new law mandates predetermined prison sentences for convictions on the offense. The gang specification is similar to a gun specification, which adds one to three years to the original crime sentence.

Understanding Gangs

The Akron, Ohio, Police Department's Gang Unit has identified 30 gangs operating in the city. Recently, this unit has begun to incorporate mapping into their efforts to identify the different gang territories and track gang activity. To understand the workings of a gang, one must be able to track members' patterns of activity and show that the gang is an organized group. This can be accomplished by establishing the gang's defining indicators, such as colors, dominant sides (e.g., right pant leg up or hat off to the right), hand signs and graffiti.

Graffiti is the bulletin board of a gang. Gang members use graffiti to communicate with fellow or rival gang members and to send a message to law enforcement officers and citizens to stay out of their territory. By nature, gang activity and gang affiliation is related to a given area or space. Many gang names are perfect examples of this spatial relationship; for example, there are Akron's F-Stones, who borrowed their name from the Firestone neighborhood in which the gang founders reside. The problem is that gang activity is not isolated to just the home neighborhood. Graffiti markings play an important role in forming each gang's territorial boundary. GIS enables police to identify and record gang boundaries and to track gang activity.

Gang Tracking

In the past, maps of gang locations were based on the Gang Unit's estimation of central points where they believed gangs were operating. This process was useful as a starting point in identifying gang locations, but it was not sufficient when gang boundary lines were needed or when maps were to be used in court. To combat this problem, the Gang Unit has begun the rigorous task of documenting and cataloging each case of graffiti observed in the greater Akron area. The process begins in the field with Gang Unit officers who use Polaroid cameras to photograph the graffiti and then mark the photo with the graffiti's location. The next step is to interpret the graffiti, which is done by a Gang Unit officer trained in the meaning of gang graffiti. Different examples of graffiti used by Akron's gangs are "Thug Life," "Slob" (a derogatory term for a Blood), 666 and 187 (representing the California penal code for murder). The photographs are then turned over to the Planning and Research Unit, which digitally scans the photographs and collects such crucial data as location, gang affiliation, date observed and graffiti description.

Gang Boundaries Through GIS

The Planning and Research Unit uses ESRI's ArcView to map boundaries of the more than 30 Akron gangs. The first step is to enter collected data into a Microsoft Excel spreadsheet, which is exported to ArcView in DBF format. In ArcView, addresses are geocoded to a street map of the city. Finally, analysts use the graffiti locations and other city features to draw a gang boundary polygon (see Figure 1). Since this process is somewhat subjective, the maps are then given to the Gang Unit officers, who fine-tune boundary locations. When these gang boundaries cross over one another, the overlapping space is considered to be a "hot zone." A "hot zone" or "conflict zone" is an area where gang conflict is most common (see Figure 2). These areas are often peppered by graffiti portraying insults between the rival gangs.

Tracking the F-Stones

The first gang to be mapped, studied and eventually prosecuted in Akron was the F-Stone Thugs. The Gang Unit had been documenting F-Stone

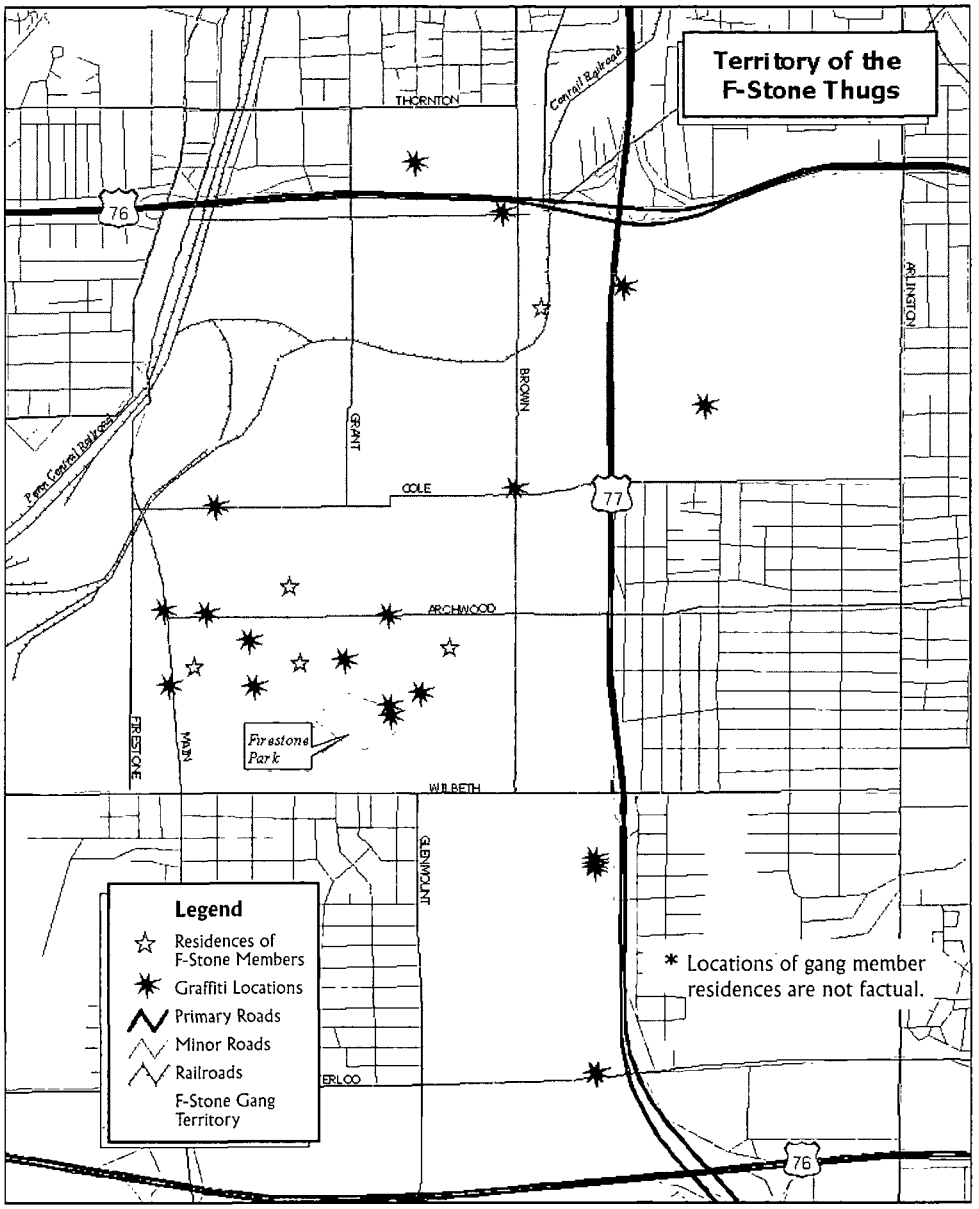


Figure 1
Territory of the F-Stone Thugs

graffiti with photographs and reports since 1996, when the F-Stones began to put graffiti up and started to have conflicts with a rival gang called the K-Town Gangsters. The Planning and Research Unit produced a series of maps depicting the target gang's activities. These maps included locations of graffiti markings along with the offenders' places of residence, work and school, as well as the locations of all documented contacts by police.

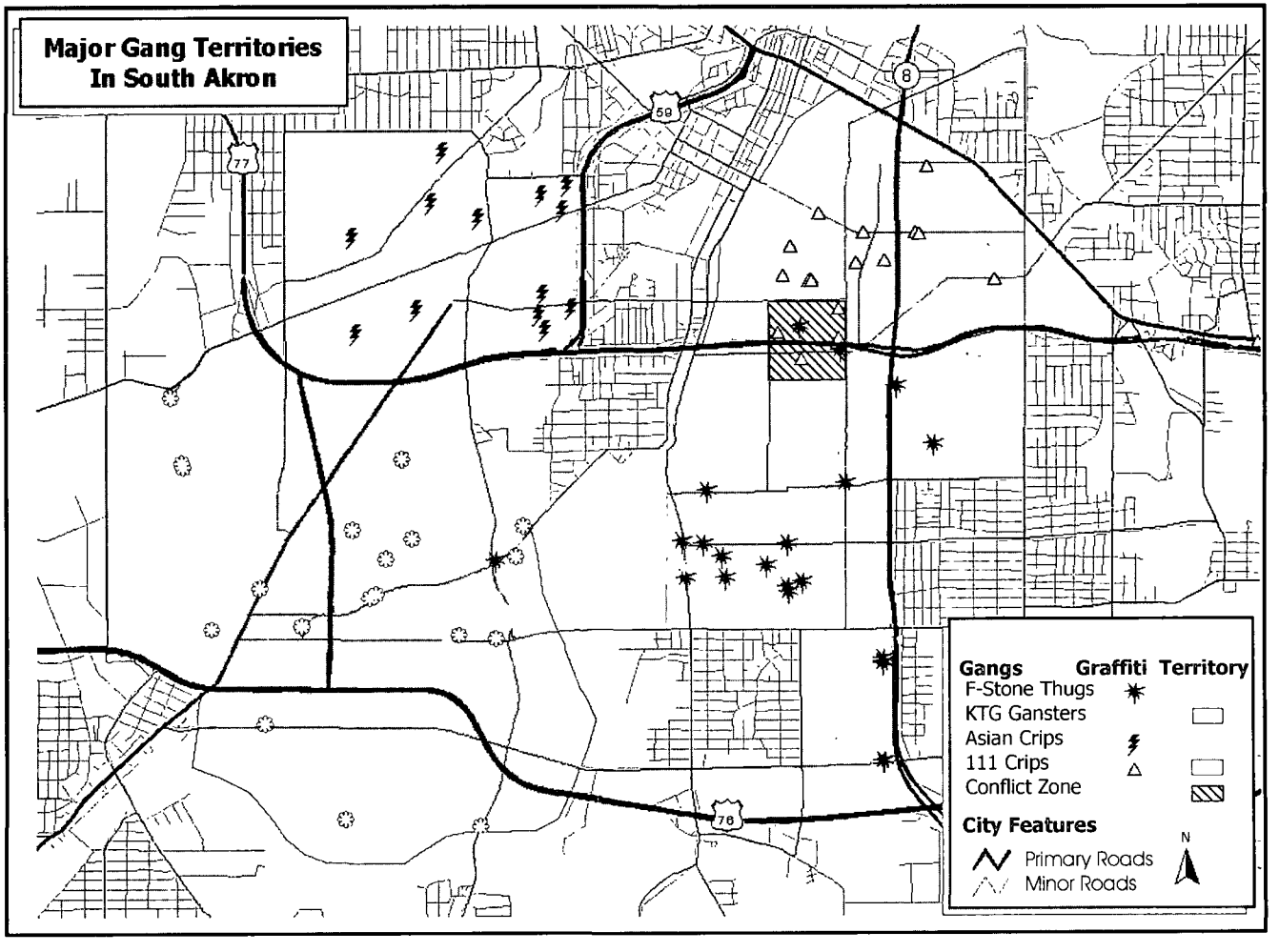


Figure 2
Major Gang Territories in South Akron

Gang Law Action

The first use of the gang law took place in February 1999, when three F-Stone gang members robbed two victims and shot at one victim as he fled. The two adult and one juvenile suspects were arrested on the offenses. All displayed signs of gang activity and were known gang members. Detectives decided to use the "Participating in a Criminal Gang" statute. With the assistance of the Gang Unit, the Summit County Prosecutor's Office and the Ohio Attorney General's Office, it was decided that this would be the first case in the state to be tried under the new statute.

Police provided the prosecution with the series of maps produced by the Planning and Research Unit. The maps convincingly displayed the gang's territory and showed offenders' connection to this space. The Planning and Research Unit was ready to print large versions of the maps and project the maps in a courtroom, but the prosecution's strong case persuaded the offenders to plead guilty before going to court. Based on the original charges, the first adult offender received seven years in prison and the second adult five years. The additional work provided by the Gang and Planning and Research Units allowed the prosecutors to be the first in the state to sustain a conviction under the new gang law, which ultimately increased the suspects' original sentences by a mandatory one year.

This first conviction helped make the gang law concrete. Subsequently, Akron's Gang Unit has begun cases against several other gang members in the city. These cases now involve collecting geographic data, supplying the District Attorney with gang maps and creating large display maps should the cases reach court.

Future Plans

The Planning and Research Unit, along with the Gang Unit, is in the process of taking the gang boundary project a step further. To begin with, the department plans to replace the static paper gang maps discussed above with an interactive gang-tracking GIS. This system will use ArcView's hot linking function, allowing officers to click on a map symbol and instantly view a picture of the phenomena at that location (see Figure 3). Pictures of gang graffiti will be linked to their locations, and mug shots of gang members will be linked to the locations of their residences. These tools will allow the Gang Unit to solidify their mental maps of gang activity and educate new officers or the public on the city's gang situation. Through projects such as gang boundary location, the Akron Police Department has begun implementing GIS as an everyday tool in the ongoing battle against crime.

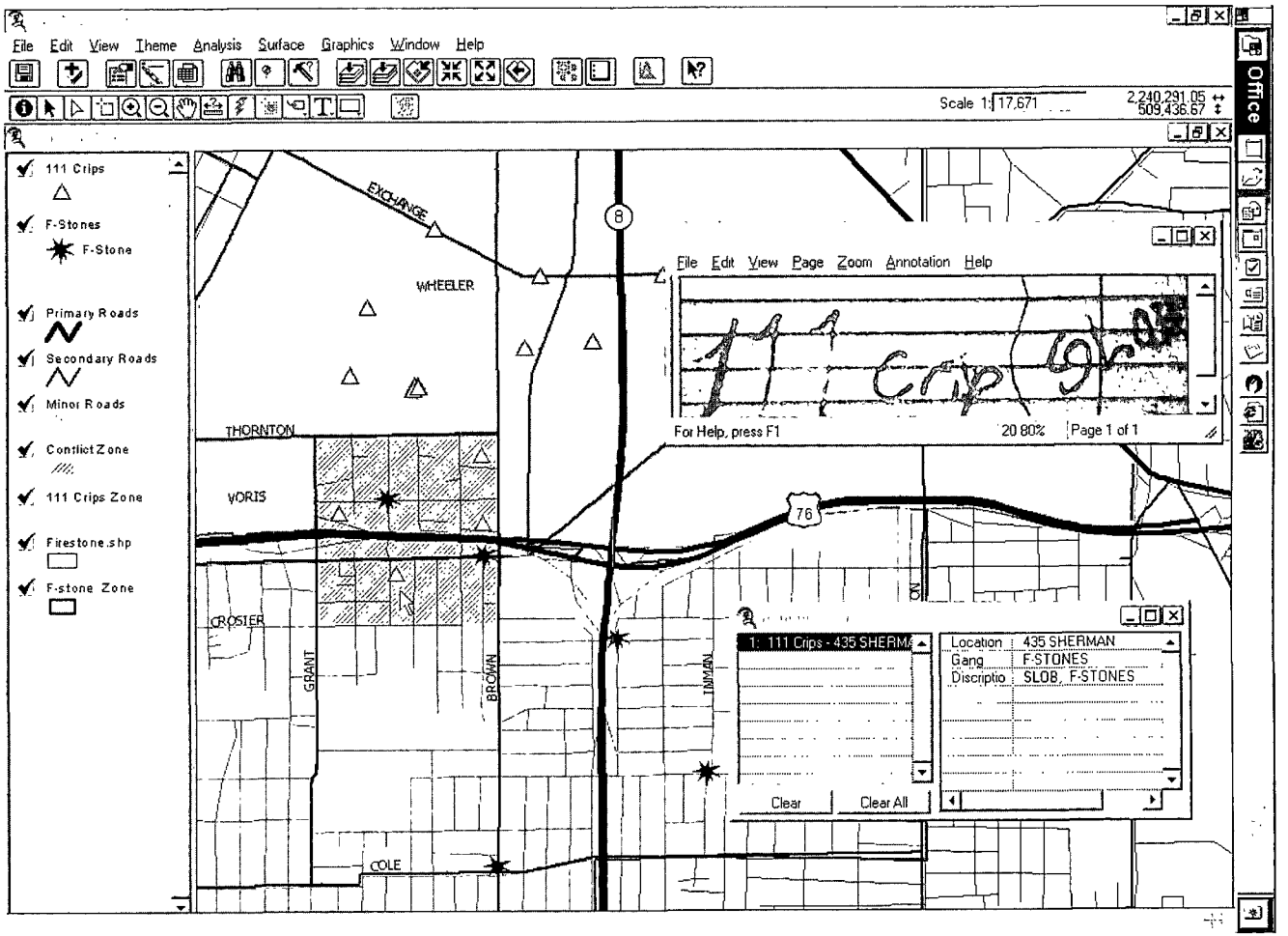


Figure 3
Example of Hot-Linking Function

About the Authors

Aaron C. Otto is a Masters of Planning student at the University of Akron. He works for the Akron Police Research and Planning Division through an assistantship. Otto earned bachelor's degrees in Geography and Public Administration in 1998 from the University of Wisconsin–Whitewater. His areas of specialty are remote sensing and Quantitative GIS.

Kenneth W. Maly is a crime analyst at the Akron Police Department. He began his career in law enforcement as an intern with the Akron Police Department and is responsible for building the department's GIS system. He has recently been hired as an analyst and continues to develop and promote new applications of GIS throughout the department, as well as to manage federally funded projects. He earned bachelor's degrees in Economics and Geography from the University of Wisconsin–Whitewater in 1997 and a master's degree in Geography from the University of Akron in 1999. His areas of interest are GIS, statistics and CPTED.

Don Schismenos has been a police officer for the Akron, Ohio, Police Department for more than six years. He is currently assigned to the Street Crimes Gang Unit and has past assignments in the Community Oriented Policing Unit and the Street Narcotics Uniform Detail. Schismenos was previously employed with the Cuyahoga Metropolitan Housing Authority. He has an associate degree in Criminal Justice from the University of Akron and has completed three basic Ohio Police Academies. He is a member of the Midwest Gang Investigators Association and is the coordinator of the Summit County Gang Task Force.

Using GIS for Police Redistricting

Amanda N. Neese
Charlotte-Mecklenburg, N.C., Police Department

BACKGROUND

The Charlotte-Mecklenburg, N.C., Police Department (CMPD) was formed in 1994 by merging police systems for the City of Charlotte and Mecklenburg County. Mecklenburg County's population is approximately 609,107 and continually expanding. Given the development in the area, workload indicators (e.g., calls for service, violent and property crimes, annexations, etc.) suggest that certain areas of the city are not adequately covered by patrol officers based on traditional deployment methods. This inefficient deployment causes officers to run from call to call with little time for problem solving.

The CMPD has four service areas: Adam, Baker, Charlie and David. The main problems are in Adam and Charlie. Currently, the population, geographic area and crimes committed outweigh the number of officers available to work in certain subservice areas, or districts (designated Adam 1, Adam 2, etc.). In analyzing the allocation of officers to service areas, one must consider population, square mileage and volume of crime. As Figure 1 indicates, Adam 1 and Charlie 1 are large districts with sparse populations; their levels of crime per square mile are thus relatively low, requiring few officers per square mile. Adam 2 and Charlie 2, on the other hand, are small but heavily populated. Their higher ratios of crimes to area makes them more labor-intensive to police (i.e., they require more officers per square mile).

Due to the imbalance of police resources and the lack of time available to problem-solve, the department decided to embark on a redistricting project in November 1998. The project aims to balance the workload in each of the 12 Districts. An important aspect of the project is to maintain neighborhood boundaries and community linkages.

THE PROJECT

A committee of a deputy chief; three majors; two captains; the Research, Planning and Analysis director; and two members of the Research, Planning and Analysis Bureau represented each Service Area in the Charlotte-Mecklenburg region. Together, the group developed a "personnel allocation formula that would allow on-demand or seasonal analysis of Service Area or Investigative Division needs versus available personnel to meet those

District	Square Mileage	People per Square Mile	Part I & II Offenses per Square Mile	Officers per Square Mile
Adam 1	58.30	396.52	102.46	.89
Charlie 1	129.62	3491.27	56.54	.16
Adam 2	37.46	738.88	204.27	1.07
Charlie 2	12.95	1110.51	600.54	.49

Figure 1
Police Resources in Districts Adam 1, Charlie 1, Adam 2 and Charlie 2

needs" (Wittman 1998). Additionally, the group discussed goals, data considerations, community (both neighborhood and business) impacts, marketing and the use of a GIS—specifically ESRI's ArcView.

PROCESS

Before analyzing the redistricting process in ArcView, committee members needed to devise a formula to determine the number of required officers for each district. This formula followed the International Association of Chiefs of Police's (IACP) recommended "Workload Analysis Method to determine the number of personnel needed in the Patrol Division to adequately respond to citizen service demands" (Lumb 1996). The Department would have preferred to devise its own formula, but that was not economically feasible.

The IACP formula is

NSC + HTOC x AMPC x BF / MYH x AF = NPR,

where NSC is the Number of Service Calls, HTOC is Half of Two-Officer Calls (a subjective decision), AMPC is Average Minutes Per Call, BF is a Buffer Factor (IACP recommended), MYH is Man-Year Hours, AF is the Availability Factor and NPR is the Number of Personnel Required.

This formula is a scientific method recommended by IACP that uses "a number of intervening variables to determine the workload or citizen demand and the number of available personnel to meet this need" (Lumb 1996). The Ratio Model (ratio of officers to citizens) is not reliable because it does not allow for variances in numerous community characteristics. The basis of the scientific model lies in the "belief that citizen demand for service is the most reliable indicator of how many police officers are needed to respond in an efficient and effective manner" (Lumb 1996). It was further decided that officers appointed to special assignments would not be included in the IACP formula. Positions such as school resource officers, lake patrol and investigators do not follow the same schedule as a patrol officer and therefore would negatively affect the Number of Personnel Required when added into the formula.

The formula was then automated into ArcView. CMPD analysts wrote a program that gathered all the variables from various computerized sources:

- An in-house, reliable Oracle database of calls-for-service was updated daily.
- Part I and Part II offenses were compiled using the Statistical Analysis System (SAS).

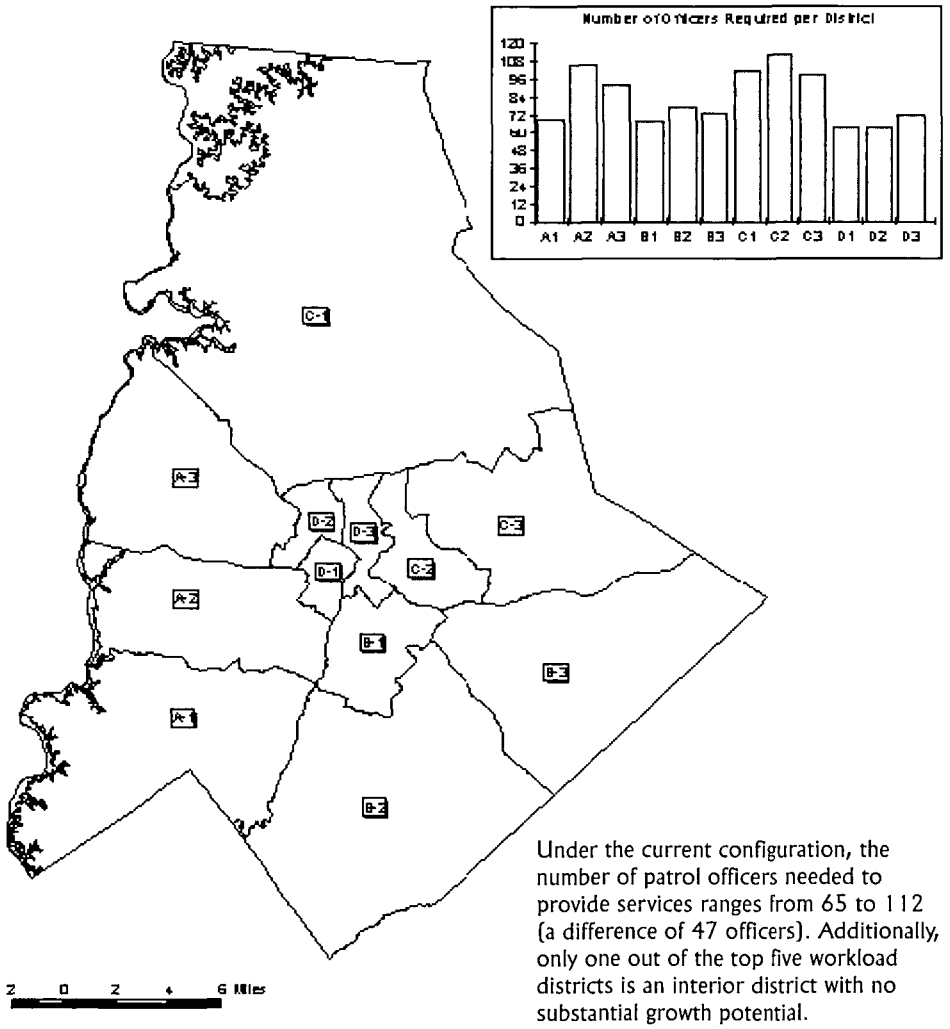
- All other information was compiled in Microsoft Excel and entered into ArcView by the analysts.

Using the automated formula, the analysts were able to create different scenarios for committee members quickly and easily. The rapid changes allowed committee members to think outside the box and view possible changes in their district (and others) along with variable affects—both positive and negative (see Figures 2 and 3, which depict district scenarios). Due in large part to this streamlined process, final district considerations were completed in August 1999. It is expected that the redistricting plan will be implemented by March 2000 (it is important to note that the progress of this project has been held back due to Y2K issues).

CONCLUSION

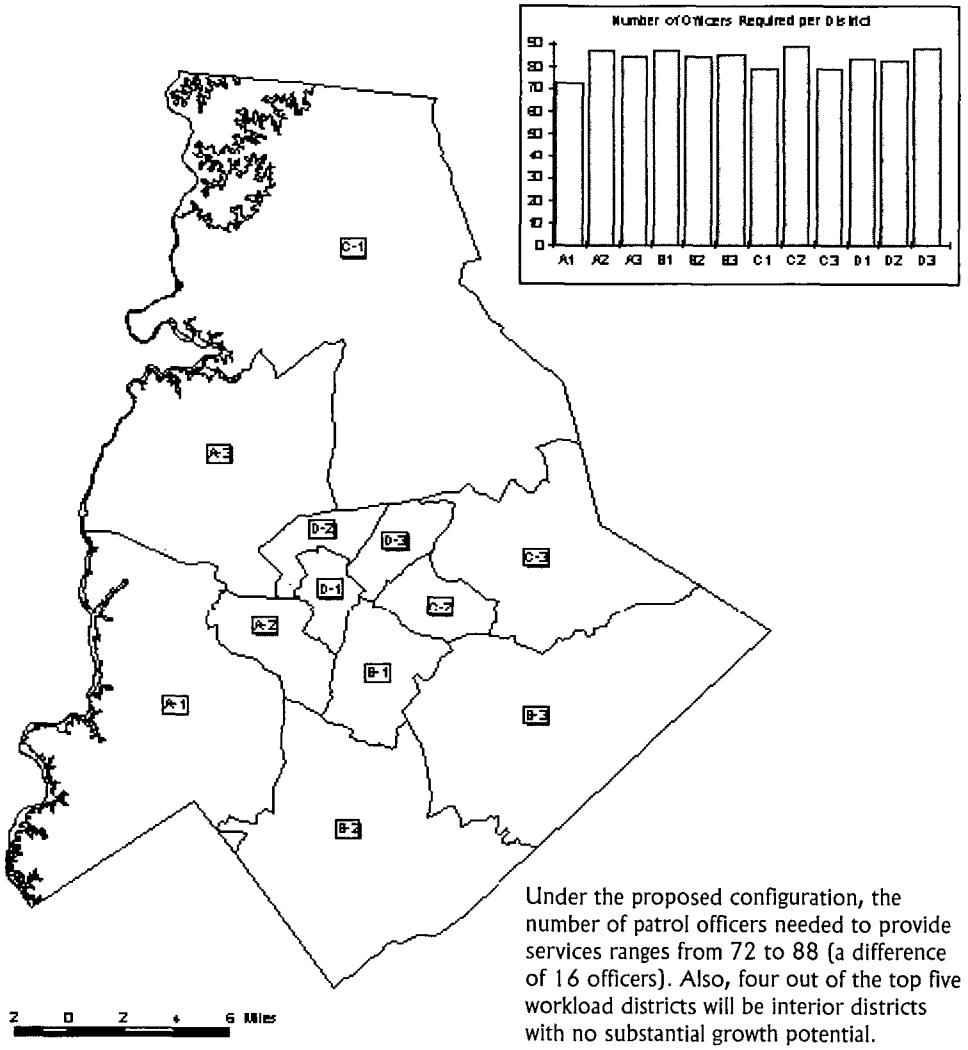
The developmental process for redistricting has taken only about eight months. Using ArcView to visualize the changes has allowed the process to move along quickly. What might have taken many more months of data collection, analysis and evaluation now takes only moments to produce.

The redistricting operation considered neighborhoods that would be directly impacted by changing boundaries, and department staff explained to community leaders that service would improve due to increased resources and staffing. Without ArcView, committee members would be unable to anticipate how neighborhoods and business districts would be affected by their decisions. "The whole process became less of a business decision for the Charlotte-Mecklenburg area and more of a cooperative process with the neighborhood and business communities," says Major Kevin Wittman of the Adam Service Bureau.



Under the current configuration, the number of patrol officers needed to provide services ranges from 65 to 112 (a difference of 47 officers). Additionally, only one out of the top five workload districts is an interior district with no substantial growth potential.

Figure 2
Current Patrol District Configuration



Under the proposed configuration, the number of patrol officers needed to provide services ranges from 72 to 88 (a difference of 16 officers). Also, four out of the top five workload districts will be interior districts with no substantial growth potential.

Figure 3
Proposed Patrol District Configuration

References

Lumb, R. 1996. "Manpower Analysis: Determining Number of Personnel Using the Scientific Method." Charlotte-Mecklenburg Police Department Report.

Wittman, K. 1998. "CMPD Looks at New Approaches to Deal with Staffing." *Informer* May 1998 (Charlotte-Mecklenburg Police Department Newsletter).

About the Author

Amanda N. Neese began her professional career with the Charlotte-Mecklenburg, N.C., Police Department (CMPD) in September 1998 as a research analyst with the Research, Planning and Analysis Bureau. She holds a bachelor's degree in Resources Management from George Mason University and a master's degree in Public Administration, with an emphasis in Legislative Affairs, from Penn State University at Harrisburg, Pennsylvania. Neese has embarked on several projects, from strategic planning to program development, to bring about positive change to both internal and external customers.

Gaining Sex Offender Registrant Compliance

Michelle Jaska
San Bernardino County Sheriff's Department

Background

The San Bernardino County Sheriff's Department is responsible for the geographically largest county in the United States, totaling 20,160 square miles with a population of approximately 1,587,400. Under the Sheriff's jurisdiction are 23 outlying stations, of which 13 are contract cities. In addition to the vast mileage within its domain, the county has grown significantly in population in recent years. For example, Rancho Cucamonga—the department's largest contract city—has experienced unprecedented growth throughout 1998.

Rancho Cucamonga is an upscale, ethnically diverse city of approximately 118,000 inhabitants and has been recognized as one of the safest cities of its size in the nation (Sheriff's Department 1998 Annual Report). As with any city, however, Rancho Cucamonga has its share of crime and criminals—including sex offenders. It thus is tasked with tracking sex offender registrants.

The Sweep

On July 15, 1999, Rancho Cucamonga was to conduct a sweep of sex offender registrants. The main purpose of this sweep was to gain compliance of individuals required to register with their local law enforcement agency as a sex offender registrant pursuant to Section 290 of the California Penal Code. A second goal was to make any necessary arrests as a result of noncompliance with Section 290 or any violations of the terms and conditions of parole or probation. As part of this sweep, the station requested the assistance of the Crime Analysis Unit (CAU) located at Sheriff's Headquarters.

Crime Analysis

Detective Roxanne East at Rancho Station asked CAU to produce sweep maps and warrant packets. CAU Supervisor Ron Lovejoy and Michelle Jaska, Crime Analyst and SHOP (Sexual Habitual Offender Program) Coordinator, were assigned to complete the sweep packets. Lovejoy ran all wants and warrants for each verified individual using all available sheriff systems,

including RMS and CLETS (California Law Enforcement Telecommunications System). Jaska compiled all California Megan's Law data and Parole LEADS (Law Enforcement Automated Data Systems) information pertaining to targets on parole. Using these compiled data, Jaska then created maps showing target locations for the sweep.

Several products were created for Detective East's sweep. First was a 34-by-22-inch map with red stars showing the general target locations (see Figure 1). A second 34-by-22-inch map had red flags and targets' names for all locations within Rancho Cucamonga. The second map was color-coded and labeled by reporting district as well. These wall maps were used as a general overview of the target area for all those involved in the sweep. On a more individual basis, 8½-by-11-inch maps were produced for each team showing the specific locations of individual targets (see Figure 2). These maps marked each specific target with a yellow flag and were labeled by name; red flags depicted other targets in the surrounding neighborhood. A photo, if available, was taken from the most current Megan's Law CD and displayed on the map. The name, address, date of birth and warrant information were also displayed on the map. Each target's rap sheet, parole record and Megan's Law information was attached to the 8½-by-11-inch map, providing all supporting documentation needed to facilitate compliance or arrest.

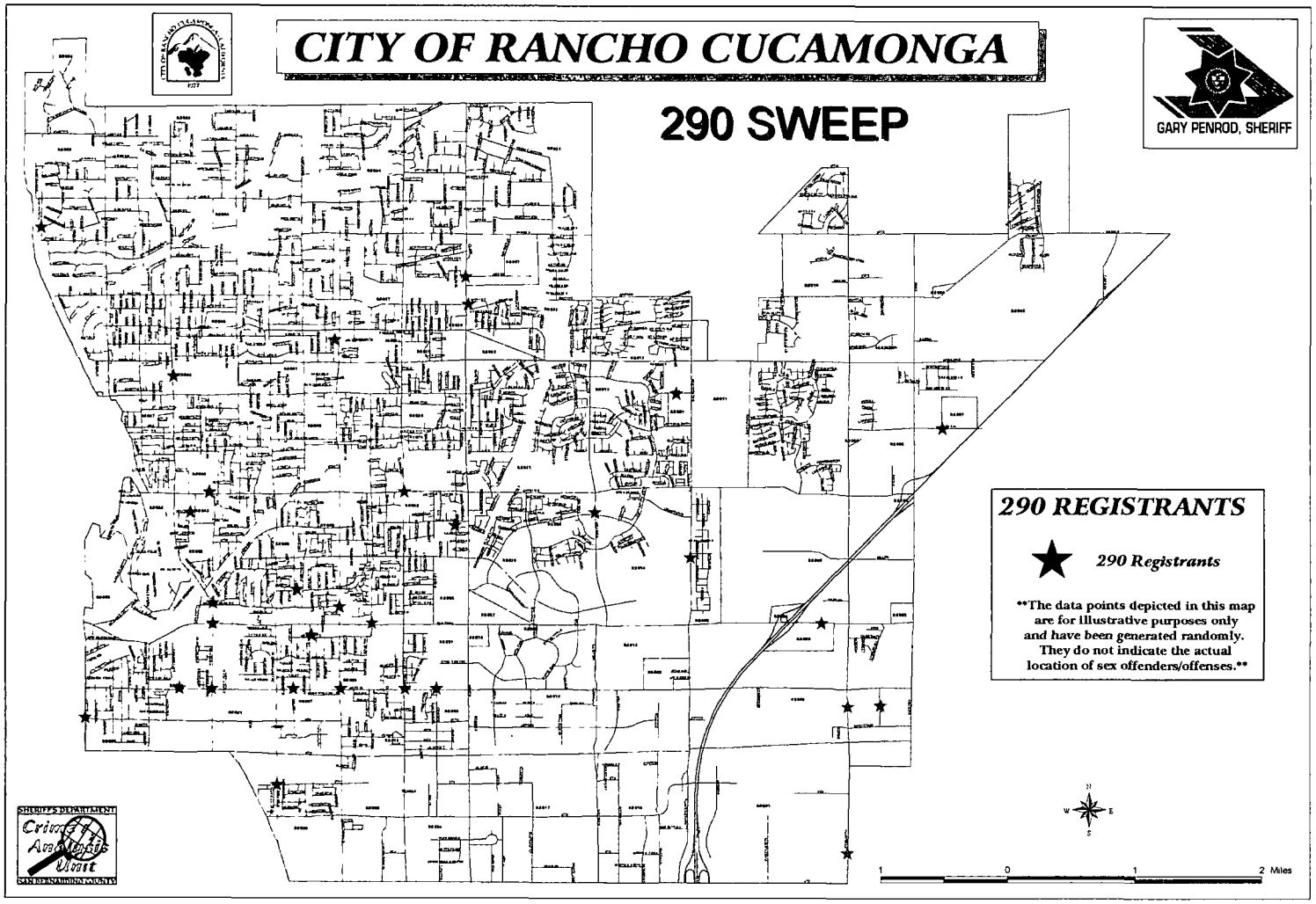
The San Bernardino County Sheriff's Department uses ESRI's ArcView, Version 3.1, on a daily basis. After the target locations were identified, they were manually entered into Microsoft Excel and then exported to ArcView in DBF format, where the locations were address-matched. Point maps were then created from the matched locations. There were a total of 37 target locations, 36 of which (97 percent) address-matched. The photographs, when available, were taken as a screenshot from the Megan's Law CD and saved in JPEG format in Photoshop 5.0.

THE AFTERMATH

When the sweep was completed, Detective East reported to the CAU that the sweep met its stated goal and was considered a success.[1] Of the 36 targeted registrants who were thought to be out of compliance, officers arrested three for noncompliance or some violation of parole or probation and issued warrants for 25 other registrants. In addition, as a result of notices left at their residences, six offenders came to the station within a week to register, and two registrants were found to be in compliance with

[1] In the interests of learning the impact of their efforts, the analysts had asked Detective East to provide feedback on the use of their work products.

Figure 1
Map of General Target Locations



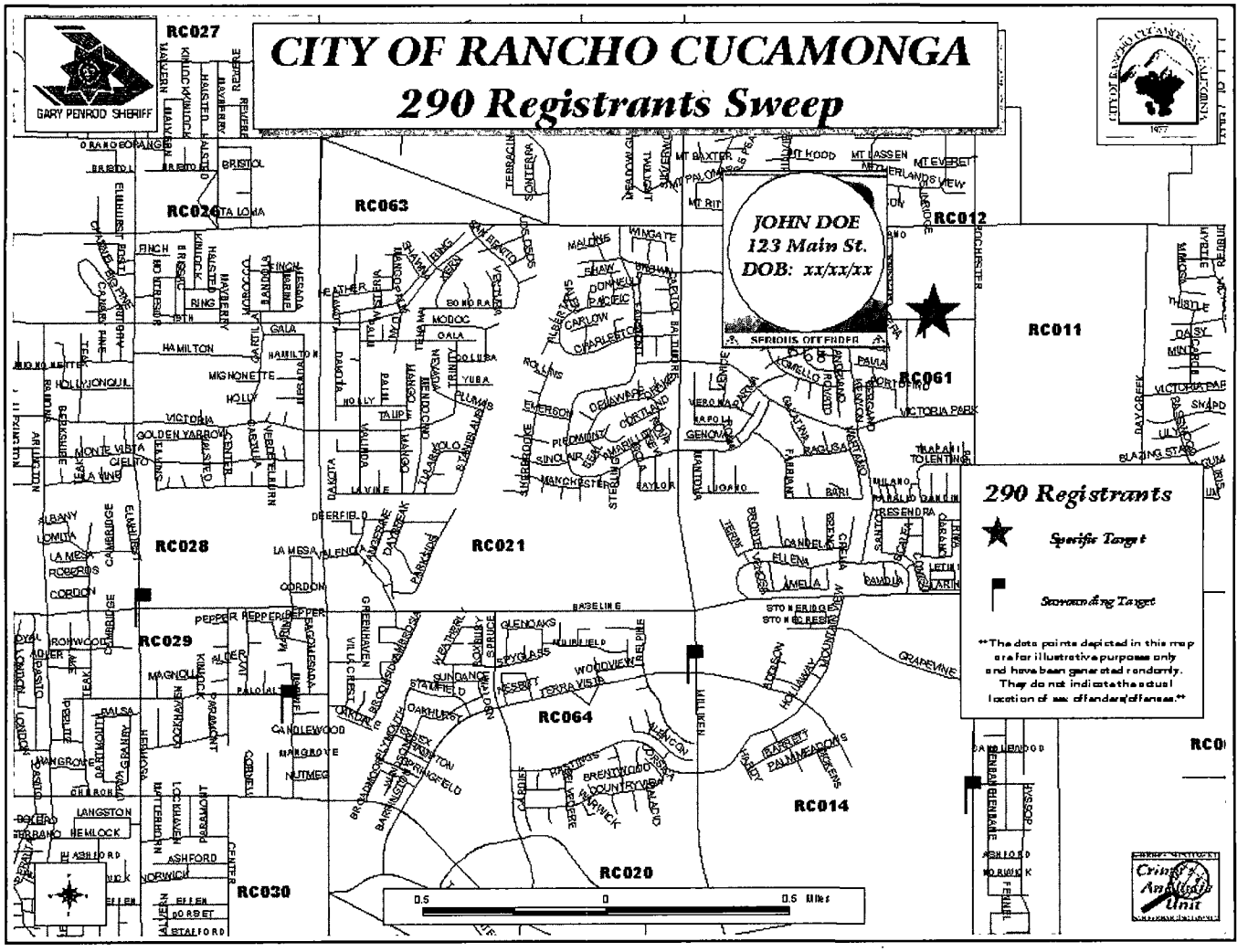


Figure 2
Map of Specific Target and Neighboring Targets

current registration requirements (the information had not been entered into the appropriate place in the Sheriff's Department).

Further Applications

This project has led to similar projects for other stations. In some stations, a map is produced of the 290 registrants, parolees or career criminals as a clear overlay. This static data can be used from week to week or month to month. A new crime map is then created to show where crime is taking place in that jurisdiction. The overlay map can be put on top of any crime map to analyze possible relationships between crimes and residences of the 290 registrants, parolees or career criminals. This method can give patrols a lead on who is living where and what is happening in that area. Charts and graphs are included to show possible increases or decreases in a specific crime over weeks or months. This can help identify a problem or trend that may need attention, and the CAU can then analyze possible causes. A statistical analysis can also be performed on the time of day, day of week and type of crime occurring in a specific geographic area.

As a result of this success, CAU has been asked to prepare for a criminal offender sweep of another County area. This next project will allow CAU to go into more depth. Individuals will be identified who may not be in compliance with the terms and conditions of their parole or probation requirements. In addition, individuals who qualify as career criminals pursuant to California Penal Code Sections 999b to 999h will be identified and documented. The same process will be completed by running each target's rap sheet (criminal history), confirming his or her address with the Department of Motor Vehicles, checking the Megan's Law database and running Parole LEADS.

Conclusion

Besides the success of the sweep in tracking and gaining compliance for sex offender registrants, this project revealed some of CAU's capabilities and functionality to others throughout the department. For many, the sweep opened up doors to different uses of crime mapping. The sweep was also used as an example in the Community Service Officer's quarterly training, demonstrating the variety of projects that can be accomplished through mapping. Officers can now take that knowledge back to their stations and attend patrol briefings with additional resources in their efforts to fight crime.

ABOUT THE AUTHOR

Michelle Jaska joined the Crime Analysis Unit of the San Bernardino County Sheriff's Department in November 1997. She is certified through the California Department of Justice as a Crime and Intelligence Analyst and has a bachelor's degree in the Administration of Criminal Justice through Chapman University in Orange, California. Jaska has also been trained in the areas of Missing and Unidentified Persons, Violent Crime, Criminal Intelligence, Sexual Offender Profiling and Advanced Criminal Investigative Analysis. She has taken on the role of SHOP (Sexual Habitual Offender Program) Coordinator and is responsible for notifying all county law enforcement agencies regarding the release of any sexual habitual offender into their jurisdiction. Jaska also is vice president of programs for San Bernardino's regional Inland Empire Crime Analysis Association (IECAA) and co-chairman of the 2000 California Crime Analyst Association Conference.

Enforcing Civil Gang Injunctions

Janet Polk
San Diego Police Department

Makini M. Hammond
San Diego Office of the City Attorney

Chad S. Yoder and Mona L. Burke
San Diego Police Department

Background

San Diego has a unique blend of geographic, demographic and cultural diversity. With a population of 1,225,000, the city is the nation's seventh largest. Its 331 square miles contain inner-city barrios, sprawling suburbs, commercial zones, small rural ranches and farms, light and heavy industrial areas, vast military reservations, beaches and open wilderness areas. San Diego's population is 55 percent White, 23 percent Hispanic, 13 percent Asian/Other and 9 percent African-American. The Asian/Other population includes large Vietnamese, Cambodian, Laotian, Hmong, Filipino and Ethiopian populations, many of whom were refugees. There are numerous neighborhoods with high concentrations of particular ethnic groups sharing a common language and heritage.

Problem Identification

Street gangs are present in several areas of San Diego, and a number of them claim areas with overlapping or coincidental boundaries. The largest number of street gangs resides in neighborhoods located within a geographically central portion of San Diego known as the Southeastern Division (see Figure 1). Southeastern has a high presence of Hispanic, Asian, Filipino and African-American gang activity. More than 14 documented street gangs claim boundaries there, and several more share the area. One extremely active gang in this area is known as the Lincoln Park Gang.

Janet Polk, the gang detective assigned to monitor the Lincoln Park area, observed that gang members were constantly causing problems in

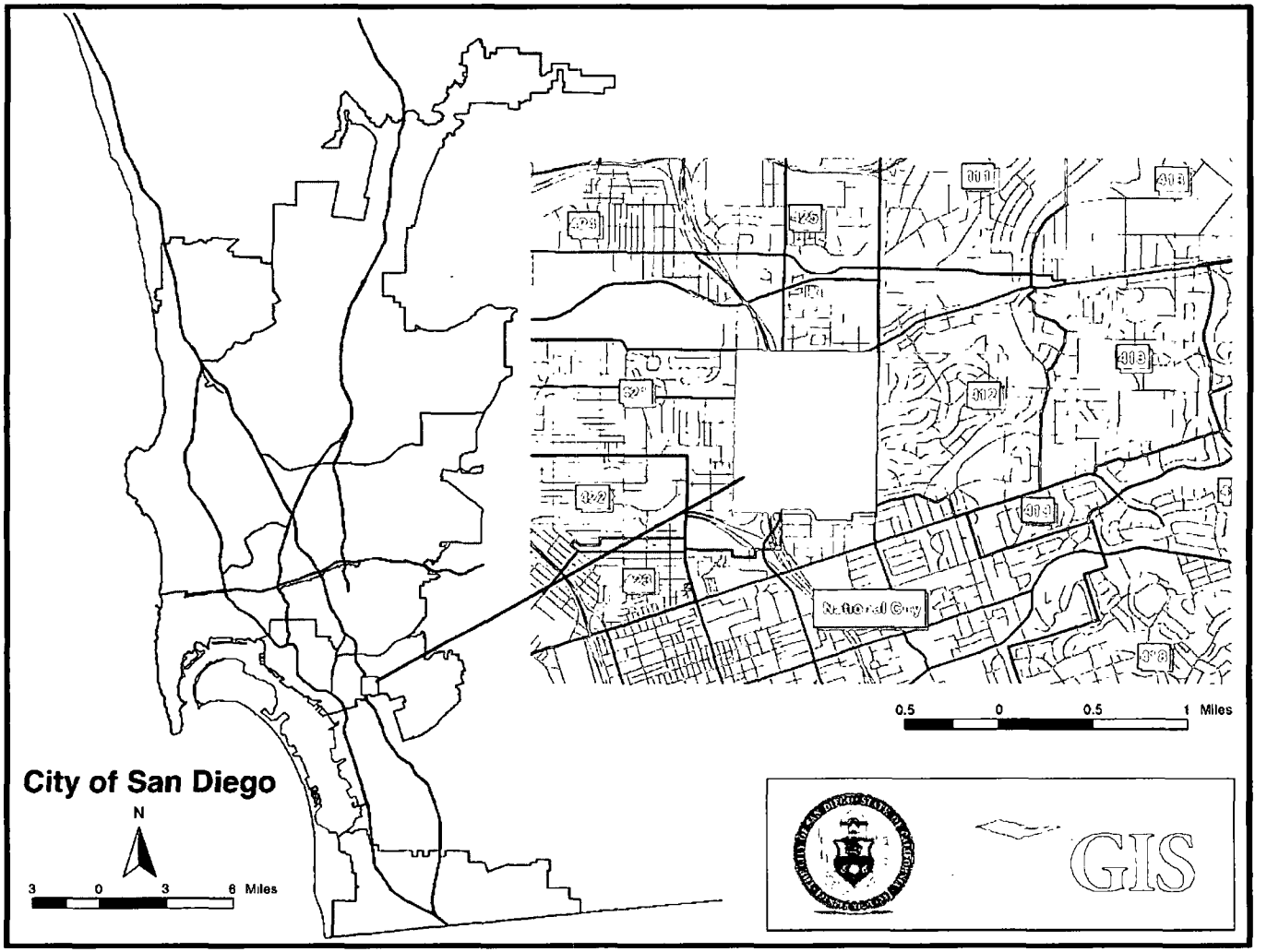


Figure 1
Target Area, Southeastern Division

the neighborhood. Children were not safe to play in their yards, community members feared going to the store or using the parks, and residents were often injured or killed in the gang violence crossfire. Detective Polk began to evaluate the problems in the neighborhood and what could be done to combat them. She noted that particular gang members seemed to instigate or control much of the activity. Consulting with the Crime Analysis Unit (CAU), Polk learned that—although the overall crime rate in the city has declined over the past several years—the Lincoln Park neighborhood experienced a much higher crime rate than the city average, particularly with violent crimes (see Figure 2). In the first eight months of 1998, the city's overall violent crime rate was 7.3 violent crimes per 1,000 inhabitants; Lincoln Park's violent crime rate was four times higher, at 29.3.

In addition to these inflated violent crime rates, Detective Polk established that (as in other gang areas) not all gang activity and crime in Lincoln Park was reported to police. In informal interviews with residents, business owners and employees, she learned all were well aware of the extent of violence in their neighborhood but did not report crimes to police due to intimidation and fear of retaliation.

RESPONSE

Although a "shotgun" approach to enforcement would certainly decrease the problems, Polk felt that this had been done many times in the past and that a "surgical" approach might have more long-term results. Working in a unique collaboration, the Street Gang Unit, City Attorney and CAU determined to enact a civil injunction against targeted gang members to decrease gang crime and violence and improve the quality of life in the community. By preventing gang members from congregating with other gang members in targeted areas, the likelihood of criminal and gang activity would decrease. Gang injunctions, however, require documentation of gang activity. Spatial analysis played a key role in this documentation process.

ANALYSIS

Based on intelligence developed by the detectives, analysts produced a list of the "top 20" gang members and the areas in which they gathered. Throughout the project, numerous maps were generated to identify potential target areas. Generating these maps presented a challenge: Some gangs claim several areas within the city, creating the need to maintain noncon-

	Violent		Property		Total	
	1/98–8/98	1/99–8/99	1/98–8/98	1/99–8/99	1/98–8/98	1/99–8/99
Lincoln Park	29.3	18.1	32.9	29.5	62.1	47.6
Southeastern	11.1	8.3	24.3	23.2	35.4	31.4
Overall City	7.3	6.1	37.9	35.1	45.2	41.2

Figure 2
Violent, Property and Total Crime Rates per 1,000 Inhabitants in San Diego, California January 1 to August 31, 1998, and January 1 to August 31, 1999

tiguous boundaries. CAU, working closely with the Street Gang Unit, regularly updates a custom gang boundary layer developed using ArcInfo Regions. This data model was adopted by CAU for boundary maintenance due to its ability to handle noncontiguous, coincidental and overlapping gang boundaries as a single geographic layer.

Analysts also mapped person crimes, property crimes, calls for police service and "out of service" hours to identify problem locations. While the maps did not fully identify target areas, they did illustrate that the entire area was inundated with crime and had potential target areas. The detective and City Attorney Makini Hammond knew which gangs were responsible for the escalation in violence and provided data to CAU to identify the crime locations. The crimes mapped were narcotics arrests and crimes against persons, including homicides, attempted homicides, robberies and assaults with a deadly weapon (see Figure 3). The original map included icons displayed in gang colors to illustrate which gang was responsible for each crime. This map clearly depicted the areas for targeting.

Although the likely target areas were apparent on the maps, the gang detective and city attorney sought input and confirmation from the community. They contacted residents, business owners, employees, students and teachers in the area. Many responded with quality-of-life concerns that would not necessarily generate a call to police, and the locations initially identified on the maps by analysts were also identified by the community members as problem locations. In addition to the violent crimes and property crimes, residents and business owners noted gang members yelling, flashing signs at rival gang members, fighting, drinking, blocking traffic on streets and sidewalks, throwing trash in yards, urinating in yards and verbally abusing elderly residents. Gang members' attendance at the local school's sporting events required extra security to maintain order and to escort the event's receipts to the office safe. One resident noted that drive-by shootings had become so common that young people no longer experienced deep fear or concern.

After reviewing the various maps and citizen input combined with the detectives' knowledge, the detective and attorney identified specific target areas and gang members. They determined that a civil gang injunction could prevent targeted gang members from physically being in specific areas, associating with other gang members and displaying certain types of gang-related behavior. A final map was created showing the spatial distribution of crime in the area. A transparency identifying the target locations and gang members' residences was overlaid on the crime map to illustrate how the target areas and the targets corresponded to the crimes (see Figure 4). The detective and attorney then used these maps to guide and confirm the direction of the project as well as to gain final approval for the project. The

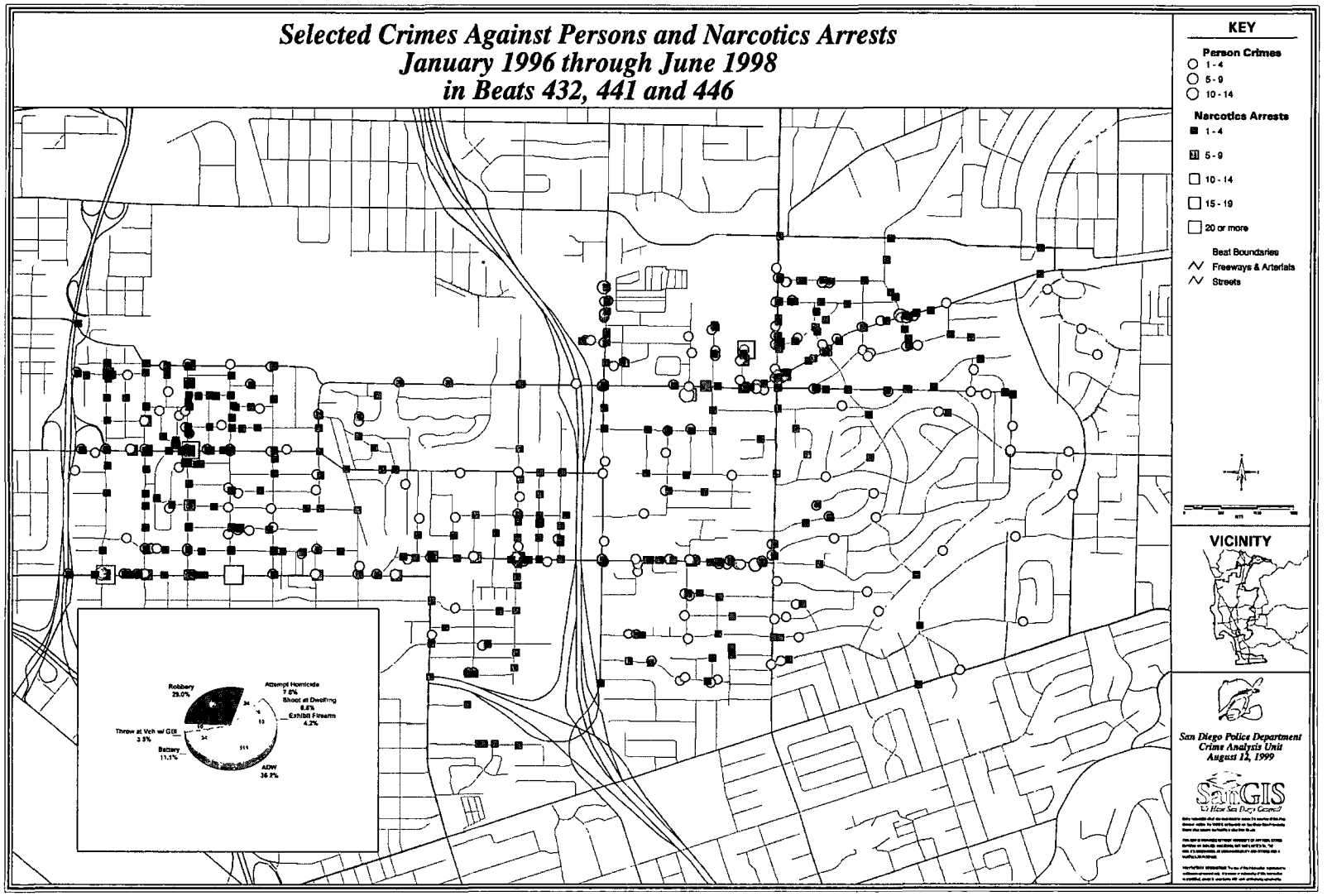
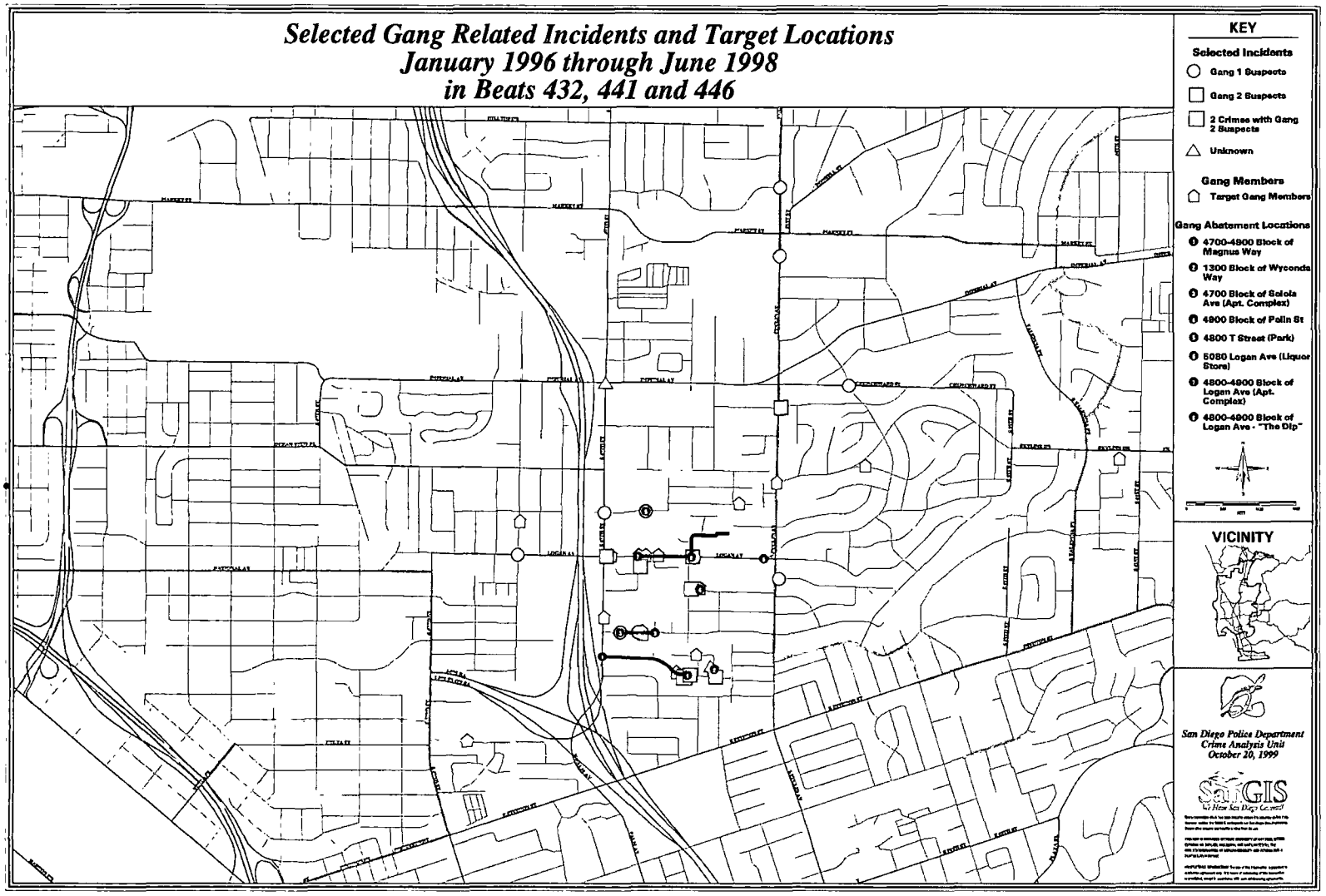


Figure 3
Selected Crimes Against Persons and Narcotics Arrests, January 1996 Through June 1998, in Beats 432, 441 and 446

Figure 4
Selected Gang-Related Incidents and Target Locations, January 1996 Through June 1998, in Beats 432, 441 and 446



maps were also used by police officers in the field (as described below) and as preparation for court if the target locations' validity was challenged.

Enforcement of the Temporary Restraining Order (TRO) began in November 1998; the TRO became a permanent restraining order in April 1999. Small binders with specific information and maps about each of the targeted gang members and areas were prepared and distributed to Gang Suppression Team officers and gang detectives. The binders allowed each officer to know exactly who the targeted gang members were and exactly where they were prohibited from congregating. The final restraining orders were issued to target gang members as they were located and served. Most have been served, but some have fled the area and cannot be contacted.

RESULTS

Since the enforcement began, there have been eight arrests. Two cases have gone to court (the defendants were found guilty), four cases are awaiting court and two were prosecution rejections. The gang injunction also appears to have had an impact on crime in the neighborhood: While the violent crime rate decreased citywide during the first eight months of 1999, Lincoln Park experienced a more dramatic decrease, from 29.3 to 18.1 (see Figure 2).[1]

The attitudes of community members and the behavior of gang members are as important as crime statistics. Community members report feeling safer because the gangs are not loitering on the streets and around businesses. Detectives indicate that gang members are unsure about police activity; consequently, some have actually left the area or toned down their behavior.

[1] It should be noted that the Stop the Violence project began five months after the initial enforcement of the injunction in April 1999. The project was initiated in response to escalating violence in the Division after the release of several gang members from state prison. This project took a proactive enforcement approach involving many different agencies. Officers conducted fourth waiver searches, impounded vehicles, held field interviews, wrote vehicle and traffic citations and made arrests. It is unclear to what extent reductions in crime in Lincoln Park can be attributed to the gang injunction versus the Stop the Violence project.

ABOUT THE AUTHORS

Janet Polk has been a police officer with the San Diego Police Department for 14 years, currently as a detective with the Street Gang Unit. During her tenure, she worked as a patrol officer in an area plagued by gang violence. In August 1987, she worked a deep-cover assignment by living among gang members to gather intelligence on gang rivalries and violence due to narcotics sales. Polk was later transferred to the Drug Abuse Resistance Education (DARE) program, where she instructed thousands of students on drug and gang prevention. As part of the Street Gang Unit, she learned that traditional enforcement was a temporary solution to dealing with gang-related nuisances and crimes and began using community policing and problem-oriented policing to improve the quality of life for community members and to decrease gang crime.

Makini M. Hammond is a deputy city attorney in the San Diego Office of the City Attorney. She is a member of the Code Enforcement Unit and the vertical prosecution unit in the Criminal Division. She has specialized in drug and nuisance abatement since April 1989 as part of DART, the city's civil nuisance abatement task force. Hammond also filed the city's first gang abatement case in November 1998. She is a member of the Weed and Seed Initiative Steering Committee, tasked with identifying and developing programmatic responses to community issues of violence, gang and narcotic activity. Hammond has a bachelor's degree in Political Science with a minor in Administration of Justice from Southern Illinois University at Carbondale, Illinois, and a doctoral degree in Law from Thomas Jefferson University. She is a member of the State Bar of California and the Earl B. Gilliam Bar Association.

Chad S. Yoder is a GIS Analyst in the San Diego Police Department's Crime Analysis Unit. He is completing his master's degree in Geography from San Diego State University, where he is involved in a partnership between the department and the university to increase the spatial analysis techniques used in identifying crime clusters and patterns. He has a bachelor's degree from Salisbury State University (University of Maryland system).

Mona L. Burke has more than 12 years experience with the San Diego Police Department. During her career, Burke has served in various assignments, most recently in the Crime Analysis Unit. Burke has been the crime analyst for Patrol, Sex Crimes and Robbery and is currently assigned to Homicide, Street Gangs and the Special Investigations Unit. She holds a bachelor's degree in Business Administration.

About the Editors

Nancy LaVigne is founder and director of the Crime Mapping Research Center at the National Institute of Justice, U.S. Department of Justice, in Washington, D.C. Her research areas include the geographic analysis of crime, situational crime prevention and community policing. Her previous work experience includes consulting for the Police Executive Research Forum, the National Council on Crime and Delinquency, and the National Development and Research Institute. She also served as Research Director for the Texas Punishment Standards Commission from 1991 to 1993. LaVigne is the author of more than a dozen publications in journals, edited volumes and technical reports in the area of crime prevention, policing and spatial analysis. She pursued her undergraduate studies at Smith College in Massachusetts, earned her master's degree at the LBJ School of Public Affairs at the University of Texas at Austin and obtained her doctorate at The School of Criminal Justice at Rutgers University.

Julie Wartell is a senior research and technology associate with the Institute for Law and Justice, where she works on several projects related to information technology and community policing. She recently completed a fellowship at the National Institute of Justice Crime Mapping Research Center coordinating the development of a series of crime mapping training modules and co-editing a book about successful crime mapping case studies. Wartell spent more than five years as a crime analyst at the San Diego Police Department (SDPD) and one year as a field researcher for the Police Executive Research Forum (PERF). Her responsibilities for SDPD and PERF included research and analysis of major problems; liaising with patrols, investigations and administration; and working on the departmentwide strategic planning effort. Wartell also has given extensive training and presentations to officers and analysts throughout the country on topics relating to crime analysis and problem-oriented policing. She holds a master's degree in Public Administration with an emphasis in Criminal Justice Administration.

About the Crime Mapping Research Center

NIJ established the Crime Mapping Research Center (CMRC) with funds available under the technology assistance provisions of the 1996 Omnibus Appropriations Act amending the 1994 Crime Act. The CMRC is headquartered at the National Institute of Justice in Washington, D.C., and its permanent staff consists of seven full-time and two part-time employees with backgrounds in law enforcement, geography, criminology and anthropology.

The Crime Mapping Research Center promotes the research and development of crime mapping through

- research, including fellowships, in-house research projects and NIJ-funded grant awards;
- evaluation of best practices, GIS use in police departments and current criminal justice applications and needs;
- development of training programs and analytic software; and
- dissemination of information through conferences, workshops, a Web site and a listserv.

Through these actions, the Crime Mapping Research Center serves as a clearinghouse for crime mapping research and development in the United States and abroad.

For more information about the Crime Mapping Research Center, visit its Web site at http://www.ojp.usdoj.gov/cmrc.

About PERF

The Police Executive Research Forum (PERF) is a national professional association of chief executives of large city, county and state law enforcement agencies. PERF's objective is to improve the delivery of police services and the effectiveness of crime control through several means:

1. the exercise of strong national leadership,
2. the public debate of police and criminal justice issues,
3. the development of research and policy, and
4. the provision of vital management and leadership services to police agencies.

PERF members are selected on the basis of their commitment to PERF's objectives and principles. PERF operates under the following tenets:

1. Research, experimentation and exchange of ideas through public discussion and debate are paths for the development of a comprehensive body of knowledge about policing.
2. Substantial and purposeful academic study is a prerequisite for acquiring, understanding and adding to that body of knowledge.
3. Maintenance of the highest standards of ethics and integrity is imperative in the improvement of policing.
4. The police must, within the limits of the law, be responsible and accountable to citizens as the ultimate source of police authority.
5. The principles embodied in the Constitution are the foundation of policing.

Crime Mapping Case Studies: Successes in the Field, Vol. 1
(Nancy LaVigne and Julie Wartell, eds., 1998)
144 pp., Product #834
ISBN #: 1-878734-61-X
Member Price: $18
Nonmember Price: $20
The Police Executive Research Forum (PERF) and the National Institute of Justice Crime Mapping Research Center (CMRC) collaborated in this volume to highlight various criminal justice agencies' successes with applying mapping to their problem-solving, prevention and enforcement efforts. The book encourages agencies' use of crime mapping and offers ideas on various ways to apply geographic information systems (GIS) and mapping. Readers have the opportunity to form their own opinions about the efficacy and applicability of these efforts to their own jurisdictions.

Crime Mapping and Crime Prevention
(David Weisburd and Tom McEwen, eds., 1998)
432 pp., Product #835
ISBN #: 1-881798-15-1
Price for Members/Nonmembers: $37.50
This book, Volume 8 in Criminal Justice Press' Crime Prevention Studies series, discusses recent advances in the uses of crime mapping in prevention programs and in criminological research. Case examples illustrate the benefits of crime mapping for community policing and crime control programs in Baltimore, Boston, British Columbia, Jersey City, Philadelphia, Pittsburgh and other jurisdictions. Contributors include: Carolyn Block, Patricia and Paul Brantingham, Marc Buslik, Philip Canter, John Eck, David Kennedy, James LeBeau, Michael Maltz, Lorraine Green Mazerolle, Andreas Olligschlaeger, William Pelfrey, Jr., George Rengert, Severin Sorensen, Faye Taxman, Karen Vincent and others.

Crime and Place
(John E. Eck and David Weisburd, eds., 1995)
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