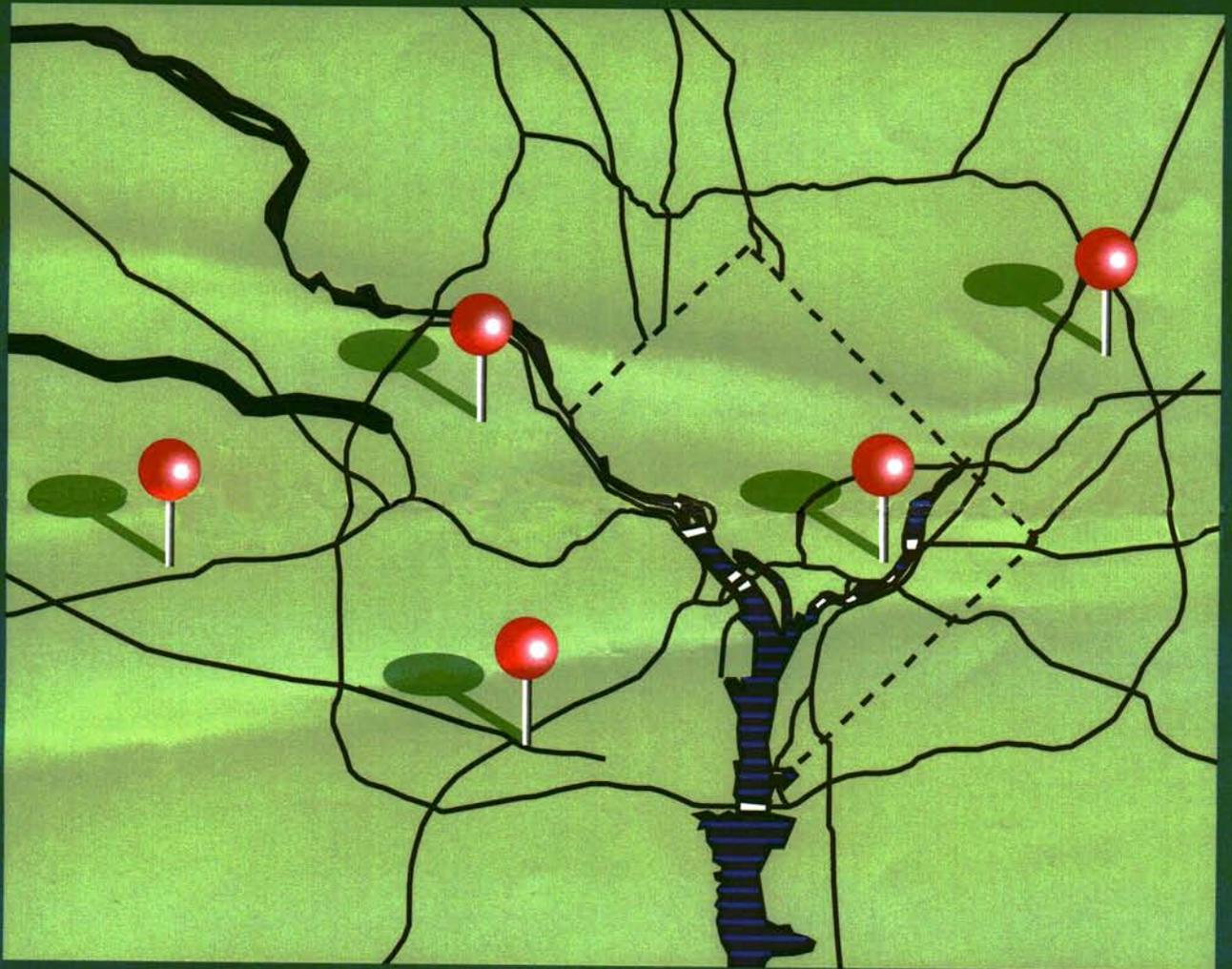


Partnering with the Police to
PREVENT CRIME
Using Geographic Information Systems



*“A Guide for Housing Authorities and Other
Community Stakeholders”*



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Chapter 1. Introduction: The Concept of Crime Prevention Planning Partnerships

The Purpose of This Guidebook

The advent of geographic information systems (GIS) has given behavioral scientists the ability to map and track a wide range of social phenomena in relatively small parcels of urban space hitherto almost unreachable in an analytic sense. Much more information about what is happening “on the ground” is now available. This enhanced analytic capacity has presented public and private stakeholders such as police departments, housing authorities, school districts, neighborhood associations, and corporate managers with the opportunity to better serve and protect the people and places in their care. Furthermore, as GIS assists one in seeing and understanding behavior patterns, it also provides stakeholders with opportunities to join together in partnerships for the common good. This guidebook is about forming stakeholder partnerships to prevent crime using GIS.

In August 1999, the U.S. Department of Housing and Urban Development’s (HUD’s) Office of Policy Development and Research published *Guidebook for Measuring Crime in Public Housing with Geographic Information Systems*. The 1999 guidebook’s primary objective is to familiarize the reader with the basics of crime mapping with GIS as they could be applied to measuring the incidence of crime in public housing developments. The 1999 guide suggested straightforward, uncomplicated approaches to examining crime patterns with emphasis on the serious offenses included in the Federal Bureau of Investigation’s (FBI’s) Part I crimes. A number of sample tables and some sample graphics were presented. The 1999 guide can serve as a primer for a variety of stakeholders who wish to employ crime mapping on a broad array of places such as public housing developments, schools, neighborhoods, privately owned apartment complexes or subdivisions of single-family homes, shopping malls, or parks.

The primary objective of this guidebook is to suggest how community stakeholders and police departments (PDs) might go about forging *crime prevention planning partnerships* (henceforth to be referred to as “**CPPPs**”) based on crime mapping. Much of the information in this guidebook is derived from recently completed HUD research that involved the establishment and observation of CPPPs between public housing authorities (PHAs) and their local PDs. However, we believe that the knowledge gained in studying the creation and operation of PHA/PD CPPPs can be applied to partnerships between PDs and a wide variety of stakeholders.

The Content of This Guidebook

At the heart of this guidebook are three central themes: (1) successfully negotiating a CPPP agreement with the local PD; (2) managing a CPPP once it is established; and (3) understanding how the technical aspects of data sharing, data processing, and the use of GIS hardware and software might best be approached so as to ensure the production of the most effective crime maps possible. These three themes are inextricably intertwined

and so surface throughout the length of this document. Admittedly, Chapter 5 does contain the lion's share of highly technical information, but is, we believe, user friendly, conveying critically important troubleshooting advice to program managers as well as hands-on GIS staffers.

What is a Crime Prevention Planning Partnership (CPPP)?

Cooperative relationships between community organizations and the police exist in many municipalities across the United States. However, even though many stakeholders regularly exchange information with their local PD, the nature of these relationships is often strongly influenced by the traditional role of the PD as staunchly independent peacekeeper and crime fighter. In these traditional exchanges, the stakeholder is usually asking for modifications to the customer services provided by the local PD. With respect to CPPPs as we envisage them, both the stakeholder and the PD actively collaborate in responding to crime problems based on an analysis of GIS crime maps covering the stakeholder's domain of interest. In the case of PHAs, public housing developments comprise the domain of interest.

The Research Upon Which This Guidebook Is Based

The information in this guidebook is the product of recently completed HUD-sponsored research which indicated that GIS-based CPPPs between PHAs and PDs are workable and have the potential to assist both partners with their respective crime prevention responsibilities. The HUD-sponsored research was designed by PD&R staff and executed via contract by the Center for Geosciences of Research Triangle Institute (RTI). The research was conducted in three cities. For 6 contiguous months, the local PD provided the HUD contractor, RTI, with the prior month's crime data (reported crimes and 911 calls-for-service) which were used to create maps of crime incidents and police calls, respectively, in and around public housing developments. At least once a month (and frequently more often as needed), representatives of the local PHA and the local PD met to discuss the crime maps and 911 call maps and, where appropriate, plan crime prevention activity. Representatives of HUD and RTI participated as observers in the monthly PHA/PD meetings. Throughout the 6-month research period, both the PHA and PD were encouraged to suggest modifications to the design of the maps. Usually, only one or two PHA developments were the focus of each map. In a subsequent chapter of this guide, the various map formats that grew out of the research project will be discussed. No design features were ever "carved in stone," and our experience suggests that the only constant in crime map design should be the willingness to adapt the maps to the work at hand.

An Overview of How Crime Prevention Planning Partnerships Work

In the vast majority of cases, the notion of establishing a CPPP originates with a stakeholder like the local PHA that wishes to improve the quality of life in its developments by reducing crime and associated disruptive behavior. PHA management requests a meeting with executives at the local PD in order to make the following

proposition. The PHA will pay the PD for periodic downloads of crime data. The PHA will reimburse the PD for the cost of generating these data. The stakeholder will then hire a GIS consultant, perhaps a graduate student or professor from a local college or university's geography department, to do the actual crime mapping. The stakeholder proposes to share these crime maps with the PD at regular intervals in the context of a crime prevention planning partnership where both agree to be actively involved in a joint effort to solve crime problems in the stakeholder's domain. Active involvement on the part of the stakeholder is understood to mean making reasonable modifications to its domain in order to better control crime. By the same token, the PD agrees to make reasonable modifications with respect to the disposition of its patrols and associated resource allocation toward the same objective.

Obviously, the PD must be convinced that it will benefit from participation in the CPPP. Therefore, the stakeholder must be prepared to "sell" the concept of the CPPP to the PD. However, since most PDs stand to derive important benefits from the genre of GIS map creation upon which our CPPPs were founded, some degree of guarded optimism is justified.

The Benefits of Forming a CPPP Based on Crime Mapping

In all three of the research sites in our study, a principal benefit connected with participating in a CPPP was the receipt of useful *information* about crime patterns. In our experience, the infusion of information on crime patterns in the context of the CPPPs clearly facilitates cooperation between PDs and PHAs whereby the crime control resources available in the domain of interest can be leveraged to the benefit of both partners. Virtually all participants agreed that the crime/911 call maps fostered a new perspective on crime patterns in and around the stakeholder domain of interest. See Figure 1 for an illustration of a public housing crime map. The reader should note that the actual size of most of the crime/911 call maps used in our research was at minimum 22" by 17" (and sometimes larger) and thus a good deal larger than the sample shown in Figure 1. We have included a sample of a completed crime map in order to display what is essentially the final product. The remaining graphics in this guidebook focus on particular aspects of the mapping process and associated information and are a good deal easier to read.

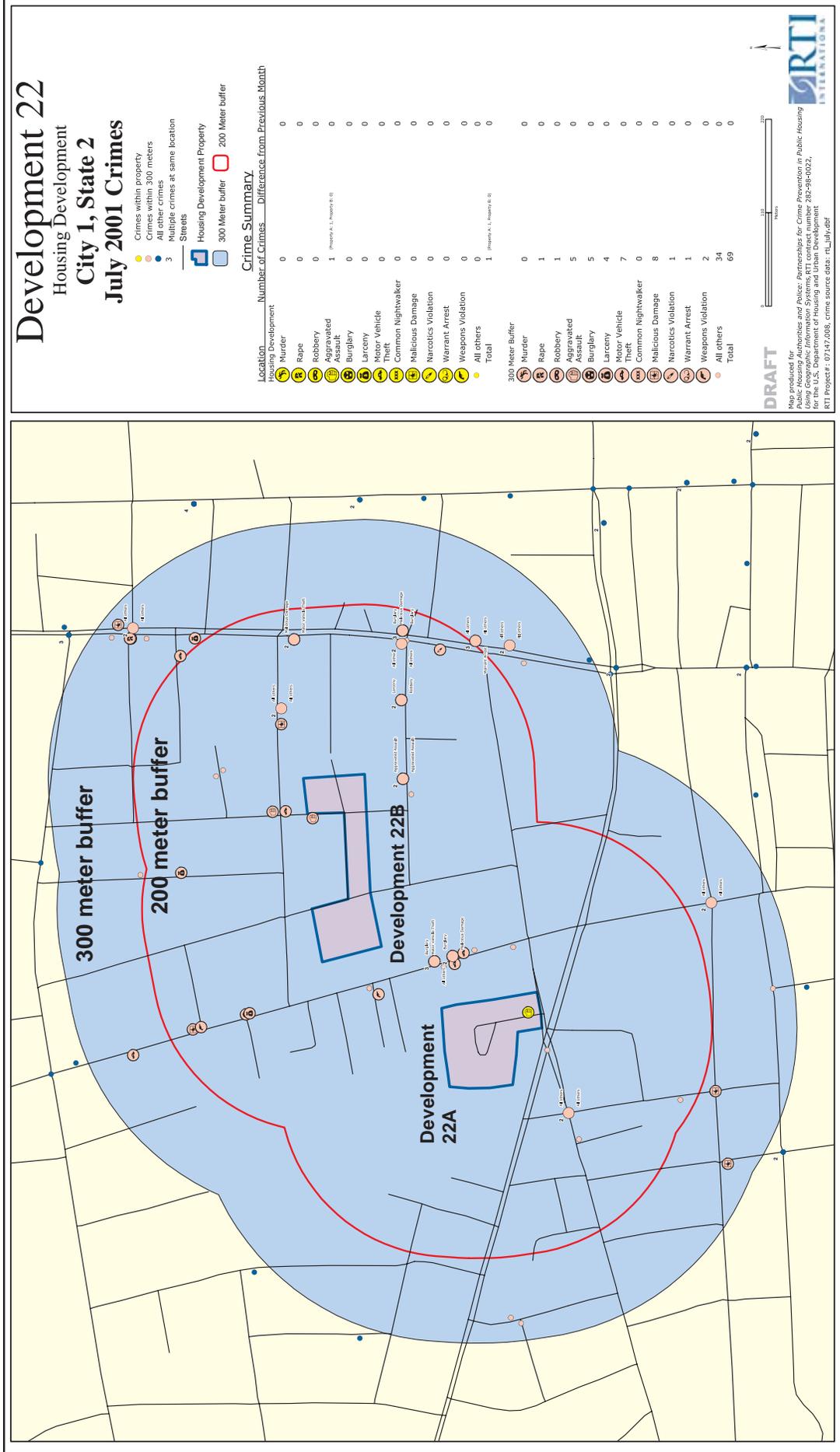
Furthermore, staff at the participating PHAs and PDs expressed satisfaction with the experience of participating in a CPPP, reporting that it enhanced their crime control efforts. In this connection, both groups reported using the CPPPs maps in their respective meetings with citizens groups. Besides their value as informational aids, the maps were seen as helping to marshal community support for crime control activities.

Not surprisingly—since crime control is central to their business—the CPPP maps seemed to have a more direct influence on the everyday operations of PDs than of PHAs that, after all, primarily are property managers. Across all three sites, the participating PDs so valued the maps produced by Research Triangle Institute (the HUD contractor

who assumed the role of GIS consultant) that they requested copies of the computerized map of their respective jurisdiction that was used as a template for tracking crime in PHA developments. In addition, the patrol officers who attended CPPPs meetings requested notebook-size copies of crime/911 call maps, covering their beats, that could be easily carried in their cruisers. Similarly, these same officers requested that lists of 911 calls and reported crimes *by shift* be appended to these maps.

Figure 1

Complete Public Housing Crime Map



Chapter 2. Negotiating a Data Sharing Agreement with the Local Police Department

Introduction

In this chapter, suggestions are presented with respect to successfully negotiating the data sharing agreement with your local PD that will serve as the foundation of a well balanced CPPP. Key issues concerning data acquisition are discussed. In addition, it is important that stakeholders and police agencies attempt to gain some understanding of the organizational workings and organizational imperatives of their prospective partners. Therefore, such information is presented with respect to PDs and PHAs. We believe that the general approach suggested here applies to a broad range of community stakeholders besides PHAs and can be used by both stakeholders and PDs as a template for conducting constructive negotiations.

Common Features of PHAs and PDs

Both PHAs and PDs are components of local government. This local government might be either a city or county entity. For example, in some places, both the police and public housing agencies operate at the county level. In a neighboring jurisdiction, both might be municipal agencies. In any event, both are local public service agencies. The federal government does NOT own public housing and is not responsible for maintaining or protecting these communities. Local governments own public housing, and local police departments are responsible for providing routine law enforcement services to the PHA's properties just as they are for any landlord's or homeowner's property within their jurisdiction.

More germane here is the fact that both PHAs and PDs are consumers of crime data. Obviously, given their peacekeeping and law enforcement responsibilities, PDs could not function without crime data and, of course, also serve as a principal source of such information. On the other hand, PHAs essentially are landlords and social service providers that use crime data along with other types of information to help ensure the health, safety, and security of their tenants.

While it is not unusual for PHAs and PDs to routinely exchange information, situations where their representatives regularly conduct face-to-face meetings to discuss crime patterns with an eye toward tactical and/or strategic planning are less common. Typically, the PHA engages the PD in a dialogue aimed at getting a particular crime problem eliminated or at least somewhat reduced. The establishment of a CPPP between the PD and a community stakeholder clearly is more complicated because it involves longer term and more frequent communication.

Crime Mapping and GIS at the PHA

Of the 3200-plus PHAs in the United States, only a tiny fraction engage in crime mapping. From their inception in the 1930s, marked by the passage of the United States

Housing Act of 1937 (See Weisel, 1990; and Holzman, 1996 for the socio-legal history of public housing in the United States), PHAs primarily have been landlords. With the advent of federal government programs that provided subsidies for privately owned rental stock, PHAs acquired additional oversight and property management tasks as well. Such programs as Section 8 and its recent successor, the Housing Choice Voucher Program, have afforded PHAs more opportunities to provide affordable housing to disadvantaged households. Essentially, the PHA's role of landlord has expanded over the years.

In the late 1980s, HUD initiated the Public Housing Drug Elimination Program (PHDEP). Prior to that time, many PHAs had engaged in crime prevention activities, but the advent of PHDEP marked the beginning of grants to PHAs specifically aimed at reducing crime. In recent years, HUD has encouraged PHAs to engage in crime mapping and has mentioned GIS-based crime mapping in its Notices of Funding Availability (NOFAs) connected with crime prevention grants. Strictly speaking, however, GIS-based crime mapping is an adjunct to crime prevention and therefore stands apart. Thus, since PHAs are continually under budgetary constraints and pressure to do more with less money, it is understandable that most PHAs have not been able to afford to routinely engage in crime mapping or even include crime analysts, GIS analysts, or professional statisticians on staff. Often housing administrators, the security manager, and the budget staff sporadically "double" as statisticians and crime analysts as needed.

In general, then, the PHA usually is cast in the role of avid consumer of crime data but itself has very limited involvement in crime analysis. Therefore, like the PD, the PHA's participation in a CPPP is something of a departure from its traditional activities. Furthermore, *the PHA's assumption of the costs associated with crime mapping in the context of a CPPP will hopefully be understood by its PD partner as clear evidence of the PHA's commitment to active participation in the crime control enterprise.*

It is important here to also note that relations between the PHA and PD are not always as congenial as they might be. Historically, PHAs have been thirsty for police services, and often PHA managers have felt that the households in their care were underserved by the police. Similarly, a 1994 HUD crime survey of public housing residents indicated a strong desire on the part of respondents for a much more substantial police presence. Ironically, research done at roughly the same time indicated that police officers in some urban centers did not feel welcome in public housing communities and saw these spaces as particularly dangerous. Given the documented distrust and hostility often encountered by the police in some poor inner-city communities from the mid-1960s into the 1990s, patrol officers had reason to be apprehensive. But, by the time the decade of the 1990s drew to a close, HUD's PHDEP grants had enabled many PHAs to contract with PDs for security services above those routinely provided. In such situations, PHDEP grants brought public housing residents and the police in much closer contact, and relations between line officers and residents and between PHA managers and police executives substantially improved with recognition of shared interests and the development of mutually supportive activities. Still, it may be helpful to maintain an awareness that vestiges of historical distrust may linger on both sides.

Crime Maps and a Clearer Picture of Crime in Public Housing

In general, public housing does not have a good reputation with respect to crime and disorder. This may be due to the fact that the troubled high-rise public housing of some older big cities has received much more notice in the national and local media and in the work of behavioral scientists and social commentators than the thousands of small, “invisible” apartment complexes that comprise the bulk of our nation’s public housing stock. Rather than being thought of as safe, decent, clean, affordable living space that serves as home to nearly 3 million Americans, images of crime and disorder seem to dominate many people’s thinking about public housing.

Interestingly, it was reported by PHA managers that GIS crime maps from our CPPP study were used to counter assertions by the media that local public housing developments were “hot spots” of crime. Furthermore, it was not unusual for PHA managers to use their crime maps in conjunction with pleas that local government crack down on businesses or residences near public housing developments that truly were hot spots. Crime maps in this study did, in fact, tend to indicate that the typical public housing development appears to suffer less crime than the neighborhood immediately surrounding it. There are, of course, some public housing developments where serious crime is a problem, but comparisons of crime maps across developments at each research site indicated that these particularly troubled public housing communities—like all “bad” neighborhoods everywhere—are exceptions to local conditions.

Crime Mapping and GIS at the PD

GIS mapping usually is linked to the crime analysis function in PDs but can also be used to help route emergency services. Crime mapping as a law enforcement tool preceded GIS by many decades—i.e., pin maps have been around for some time. Therefore, GIS can be viewed as a natural and obviously useful adjunct to traditional crime analysis. This situation may translate into the fact that the crime analysis team at the PD (sometimes consisting of one very busy person) may have a well-defined set of routine responsibilities and therefore may be doing the type of analyses that you as an outsider (i.e., community stakeholder) need. Furthermore, neither the crime analyst nor his/her supervisors may immediately understand or necessarily sympathize with your needs for particular custom-made crime maps. *Hence, as a community stakeholder and would-be outside consumer of crime data, you should have (prior to the start of negotiations) a tentative plan for how the requested information will be used to better safeguard the people and property of interest to you.*

In many PDs, crime maps are almost exclusively used by top-level police executives in conjunction with their management and public relations responsibilities. Occasionally in conjunction with special cases, GIS-generated maps also are produced in support of the work of non-uniformed police investigators in detective divisions. Actual GIS-based crime analysis activity in PDs is usually undertaken in response to reported problems that emerge in a variety of settings across the entire jurisdiction. In contrast, the typical stakeholder will tend to proactively focus on protecting relatively small parcels of land

like public housing developments. Thus, at least at first, a stakeholder's wish for highly focused crime maps may be greeted with some unease, being seen as a departure from established crime mapping protocols.

Understanding the Operations of Police Departments with Respect to Handling Information

As a stakeholder who wishes to obtain the PD's crime data, it is important that you and your GIS consultant learn a good deal about how the PD collects and stores information. Furthermore, in the process of gently investigating the PD's data processing capabilities, the PD's perspective on GIS-based crime mapping may also be revealed to you. Typically, PDs assign one or more staff members to maintain databases that contain information on crime incidents. In recent years, especially with the advent of the personal computer, PDs have computerized such files. Some PDs have state-of-the-art information systems while others may be relying on technology with limited data processing capabilities. For some PDs that have not yet been able to marshal the resources to obtain the necessary staff, hardware, and software to thoroughly automate their data processing function, GIS-based crime mapping may have yet to become an integral component of their approach to crime analysis. Here, police executives may not even fully comprehend the potential power of GIS-based crime mapping as a tool for both tactical and strategic planning. *As a supplement to negotiations, this guidebook might be of assistance in helping police executives explore the potentialities of GIS-based crime mapping.*

However, at the beginning of negotiations, we suggest that the first series of questions asked of police department staff focus on how data on crime incidents and calls-for-service are routinely collected and stored. Below is a list of such questions.

- What type of hardware and software are currently being used to keep records on reported crimes?
- Is the same hardware used to track calls-for-service?
- How is information placed into the system and how is it retrieved?
- How often are up-to-date listings available?
- How does the PD judge their own data system and why?

If the system is of fairly recent vintage, then recording and updating will be so highly automated that daily updates may be available. *Potential consumers of crime data outside of the PD would be wise to ask themselves the question "how current and complete are the crime data available to PD insiders?"* Clearly, outsiders will not be able to get these data any faster.

In later sections of this guidebook, specific types of data elements and associated supporting information will be discussed, but for now broader data availability issues are being addressed.

Your Crime Data Request

Most PHAs own a number of apartment complexes (i.e., public housing developments) as well as other single-family and multifamily properties. However, it is not likely that the PD or the local government even displays the largest public housing developments on its maps. More to the point, most PDs routinely do not keep crime statistics on small parcels of land like public housing developments, shopping centers, or even neighborhoods. Crime data are usually aggregated at the precinct or district level. Therefore, we suggest that you as a stakeholder request data on reported crime and/or 911 calls-for-service *for the entire jurisdiction*. Your GIS consultant will be able to extract information on your domain of interest from a jurisdiction-wide download. Furthermore, since your GIS consultant is handling the crime mapping chores, you will be able to craft the scope of your crime maps to include areas adjacent to your domain of interest so as to take into account hot spots that may be contributing to your crime problem.

With respect to negotiations, it is important here to recognize the fact that the data management person(s) may not have experience in the technical aspects of your request. PDs are just not used to parting with this information. Questions will arise with respect to precisely what data elements are involved. At the outset of negotiations, it is prudent to indicate that the names of individual complainants, victims, or suspected perpetrators are of no interest to you. In this manner, you will demonstrate your awareness of personal privacy concerns and thus help reassure the PD about the reasonableness of your request. Crime mapping does not require personal information such as names. Furthermore, no demographic identifiers of any kind are necessary. Although this topic will be addressed in a variety of ways in later chapters, please note here that very little information is really needed: the type of crime or 911 call; the address of the incident; and the day/time. However, even this relatively simple request may be perceived by the PD's data processing staff as an exotic and time-consuming task. As a result, you may receive a frosty reception. By virtue of their research, the authors of this guide have endured such awkward moments.

During this part of the negotiations, it is important to emphasize that you are intent on paying the costs of the proposed data transfer, e.g., overtime pay for the PD staff involved in handling your data request. Also crucial here is that you inquire as to the particular procedures by which the PD wishes to receive the reimbursement payments, since payments to a municipality's general treasury may not reach the PD. If the PD does not have direct control over the money, much of the intended impact of the monetary incentive is lost. *Seeing that the PD is satisfied with the reimbursement process is a key element in successfully achieving a "win-win" cooperative effort.*

Your GIS Consultant and the Police Department

We suggest that the stakeholder obtain the services of a GIS consultant, perhaps a graduate student or professor from a nearby college's geography department. Such an individual would be familiar with the latest techniques in GIS-based mapping. Given the consultant's affiliation with an academic institution, such a person would also probably

have access to the requisite computer hardware and software. Whether the stakeholder obtains the services of a graduate student, a professor, or a commercial vendor of consulting services, we suggest that the consulting relationship be formalized by a written contract that specifies the work to be done, delivery schedule, and cost.

We recommend against attempting to obtain your consulting services from the local PD. As mentioned in an earlier section, the PD's GIS staff may not have the requisite skills, experience, or time to execute the mapping tasks at hand. Furthermore, the PD is already the **source** of crime data and your future partner in crime prevention. It would be well not to put any additional strains on the developing partnership.

Our experience in working with PDs suggests that these organizations will be pleased that you plan to hire a GIS consultant to produce your crime maps. We have found that the CPPP drives the creation of somewhat sophisticated examples of GIS-based crime mapping that strengthen the crime prevention capabilities of both PHA and PD. Our research shows that the PD will likely initiate a collaboration with the GIS consultant and may request copies of the computer programs created by the consultant to produce the detailed CPPP maps. The PDs in this study and those in the research upon which our 1999 guidebook was based asked for and received copies of the local PHA *map layer* (i.e., computerized map of the jurisdiction that show public housing developments). Possession of this *map layer* strengthened the crime analysis capability of the PD by giving the PD the option to create its own public housing crime maps. The stakeholder's goal of crime maps for the domain of interest (e.g., neighborhood, shopping mall, or school buildings) can not be accomplished without a GIS-based *map layer* of that domain. The preparation of a *map layer* is depicted in HUD's 1999 introductory guide to crime mapping, i.e., *Guidebook for Measuring Crime in Public Housing with Geographic Information Systems*. Briefly, the requisite layer (think of it as a sheet of transparent plastic) is a computerized map of the jurisdiction with the outlines of public housing developments visible, looking very much a collection of small parks. Within the computer, this public housing *map layer* is then superimposed on a *map layer* of the jurisdiction.

Crime Mapping and Compstat

Compstat is an approach to managing police operations (McDonald, 2002) which happens to use GIS as an analytic tool in tracking crime patterns. But crime mapping does not mean using the Compstat approach for managing police operations. This is an important point because many in the criminal justice community first became aware of crime mapping due to its high visibility in the New York City Police Department's Compstat process and may believe that the two are inseparable. This is not true. They are completely independent. Moreover, in the law enforcement community, opinions differ on the utility of the Compstat approach. One's perspective on Compstat should not influence how one looks at crime mapping or GIS in general. The presence or absence of Compstat at a PD was not an issue in the research underlying the creation of this guidebook.

Chapter 3. Putting Together Your Crime Maps

Introduction

As a stakeholder with a GIS consultant in your employ, you will be able to customize your crime maps to meet your needs. This chapter will discuss some elements of crime maps that we found useful for CPPPs. Sample maps will be presented depicting examples of these elements. Mapmaking is akin to storytelling, and so the choice of map components is somewhat subjective. It is important, however, to keep in mind that crime maps have two basic elements: the domain of interest and the locations of individual crime incidents. You will have to decide how big a portion of your jurisdiction to include within your immediate domain of interest, e.g., a shopping center, neighborhood, or public housing developments. A municipality's parks department might want a series of maps, each of which focuses on a single park. The PHA might wish a crime map for each of its developments.

Street Center Line Files

Accuracy of local maps is a critical consideration in working with GIS. At the outset, you will need an up-to-date street map of your jurisdiction, e.g., city or county or region. If the local PD engages in crime mapping, this map may already be computerized into what is called a "street center line file." The use of the term "file" in connection with a street center line map connotes the fact that the map exists in the memory of the computer. When crime incidents are geocoded (i.e. have their addresses matched with actual points on a map), a computer file is created from which crime maps are generated. This computer file is known in GIS parlance as the crime data map layer. The entire process of creating this file has been termed electronic pin mapping since, in its simplest form, the product does look like an old fashioned police map where black-headed pins marked crime locations. However, old fashioned pin maps just hung on walls to be studied. With GIS-based crime mapping, the analytic potentialities are virtually limitless.

Street center line maps are usually fairly accurate representations of the local thoroughfares. Quite literally, the highways and byways are accurately depicted (as determined by lines running down the middle of the street) with respect to each other and with respect to the precise map coordinates that mark the jurisdiction on the globe. Therefore, if one were to pinpoint the sites of crime incidents by the degrees, minutes, and seconds of longitude and latitude or by conventional street addresses, the use of a street center line file ensures that images of the vicinity stand in correct relation to these incident locations. Put simply, your maps need to display the presence and position of streets and buildings as they really are. Street center line files are available from the U.S Census Bureau and also from commercial vendors. Some local governments create their own street center line files. Additional information on this topic is presented in Chapter 5.

Public Housing Developments and Other Parcels of Interest

As noted in an earlier section, public housing developments (as well as other parcels that may be important to you as a stakeholder) often are not displayed on municipal maps. Therefore, it may be necessary to place such information on the PD's maps. In GIS parlance, it will be necessary to create a "public housing" map layer/file that depicts the outlines of the development properties. Outlines of land parcels on GIS map layers are called "polygons" (See Figure 2). With the boundaries of the public housing property outlined, one can better see the patterns of crime incidents in and around these developments.

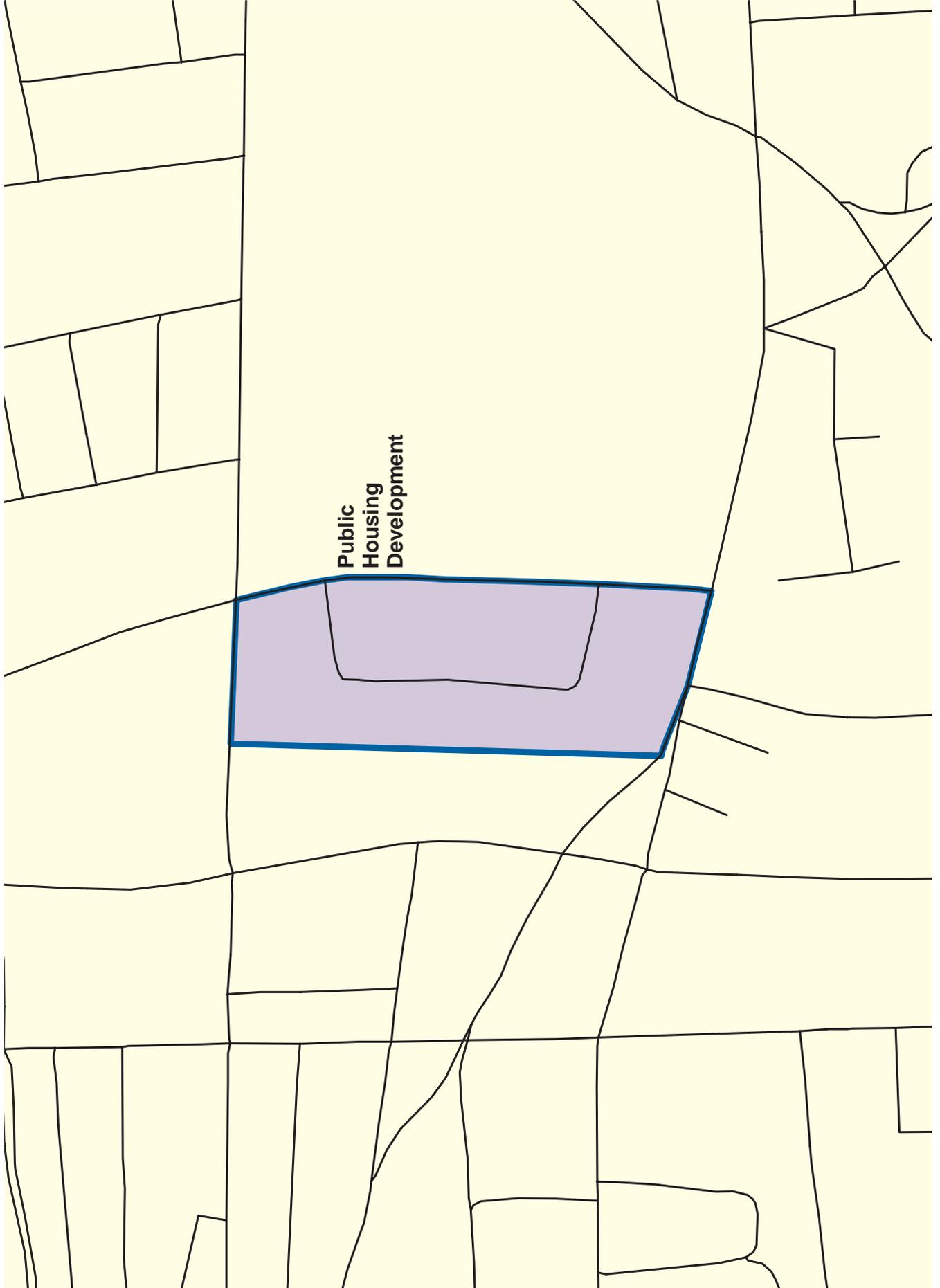
The reader will note that street names are absent from Figures 1 and 2. Street names are a routine feature of most GIS mapping software and were included on most of the maps that were generated for the research upon which this guidebook is based. However, street names have been deleted from all the maps in this guidebook so we could use actual maps but preserve the anonymity of the PHAs and PDs whose generous cooperation was so important to our research.

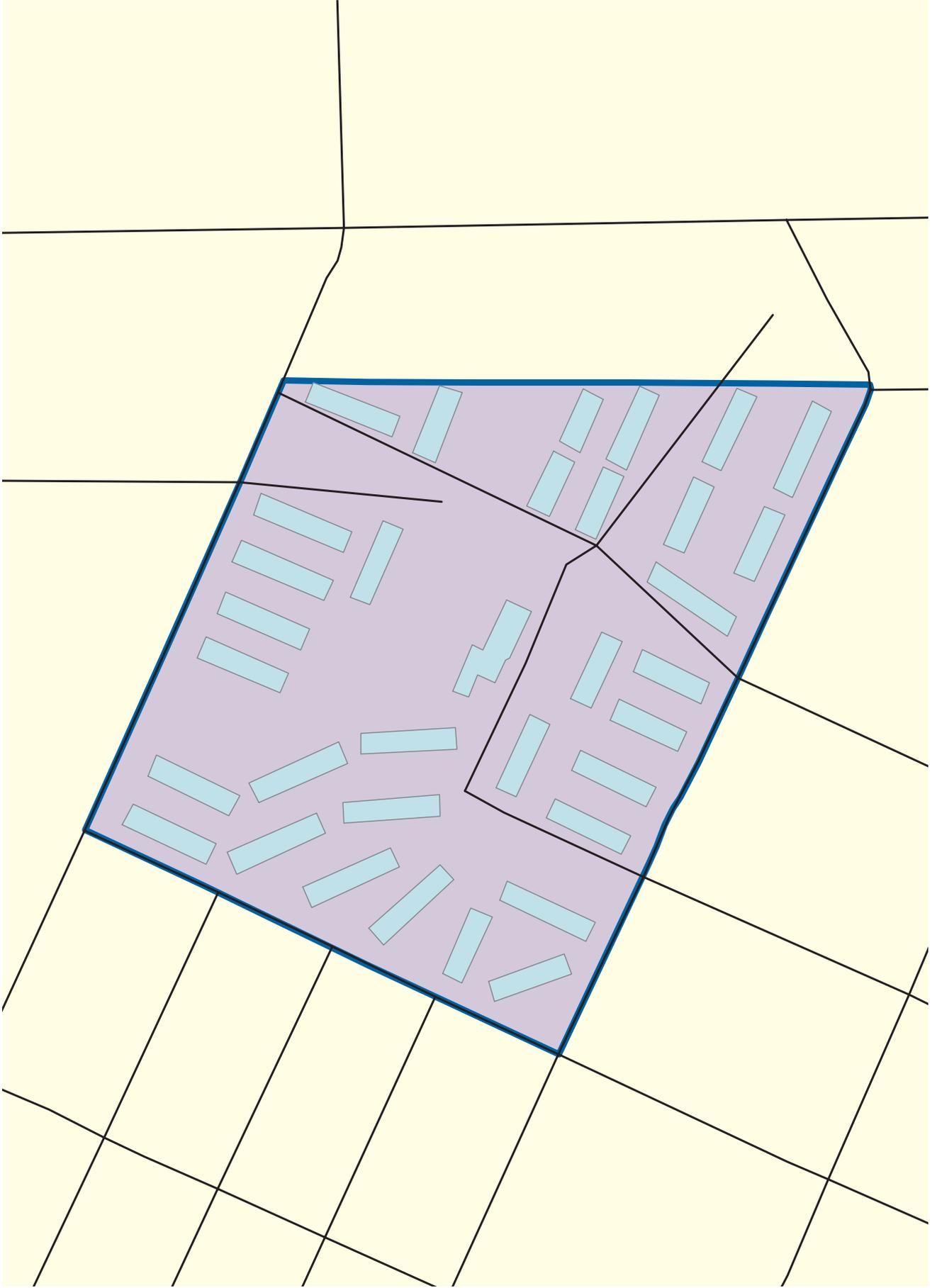
Since crime prevention planning was the objective underlying the production of the crime maps in our research, our maps were designed to "zoom in" on individual developments or perhaps two developments if the two were in close proximity. Thus, in essence, each map represents a single public housing neighborhood with the PHA property in the center of the picture. Therefore, mapping crime in and around all of a PHA's developments could require the production of a sizable number of maps. However, as a mapping partnership matures into a routine process, the focus of a mapping enterprise might reasonably be expected to narrow to a subset of properties.

In the course of our crime mapping research, we have experimented with placing building "footprints" or outlines inside the polygons that denote PHA developments on the public housing map layer (See Figure 3). This allows for a more accurate presentation of where crime incidents occurred. Building footprints might be especially important if the domain of interest is a neighborhood or a shopping mall. In order to produce such details on a map layer, it is necessary to have either surveyor's plats of the properties that show precisely where the parcel boundaries and buildings are or to have aerial photos of the jurisdiction. In the case of these aerial photos, the images of the PHA buildings would be superimposed on the map layer's public housing polygons. Although this degree of precision is visually impressive, it is labor intensive and therefore may be expensive. With respect to public housing, police reports coupled with firsthand knowledge of public housing developments by patrol officers and PHA staff will usually be sufficient to interpret crime patterns as shown on CPPP GIS map layers with only the property polygons. Conversely, if a small number of developments are the focus of an intensive crime control effort, then the inclusion of building "footprints" may prove worthwhile.

Figure 2

Public Housing Development Map Layer





Looking at Crime in the Area Surrounding a Development or Other Domain of Interest

GIS analyses of crime data from our most recent research and the research preceding the 1999 guide have indicated that rates of serious crime in the neighborhoods that surround public housing developments sometimes exceed those for the developments themselves. Also, it was not unusual for a crime hot spot such as a bar, liquor store, or private residence associated with drug traffic or violent crime to be located on an adjacent street. As well as being a focus of attention for the local PD, these hot spots are often seen by PHA managers as contributing to the crime problems in their developments. Therefore, our public housing crime mapping research routinely has included crime incidents in a 300 meter “buffer” or concentric zone around each development under study (See Figure 4). In cases where two or more developments are in close proximity, e.g., opposite sides of the street, they were viewed as part of the same neighborhood, and a single 300-meter buffer was placed around them (See Figure 5).

In the research conducted in connection with the preparation of this guide, one PD requested maps with 200-meter buffers as well as our “standard” 300-meter buffers. In that jurisdiction, the heaviest concentrations of crime near some PHA developments, in fact, did fall within that smaller buffer zone. The use of a 300-meter buffer zone was suggested to us by police in an earlier HUD crime mapping study. The use of buffers themselves, whether 200 or 300 meters, has proven to be a valuable tool in analyzing crime in and around public housing. Clearly, these buffers will likely be useful in mapping crime in and around other domains of interest as well.

Beat Boundaries

A police district, a precinct, or an entire city is often subdivided into “beats” or areas to which patrol units are assigned. For example, a section of a city might be patrolled by a two-person team in a vehicle or a single officer on foot or two officers on bicycles. With respect to public housing developments, we noticed instances like that portrayed in Figure 5, where developments were in close proximity but were served by different beats. In this connection, we sometimes found that the presence of beat boundaries on maps helped clarify areas of responsibilities for patrol officers. Furthermore, the mapping of crime patterns in some beats has suggested that these neighborhoods needed more patrol coverage or better coordination between patrol officers serving adjacent beats. The beat system is an old one and has been complicated by changes in land use patterns. In some cities, neighborhoods have sprung up in areas outside the original beat structure, but which are still clearly in the PD’s jurisdiction.

Choosing Symbols to Mark Crimes on the Map

Figures 6a and 6b display a range of symbols for a variety of calls-for-service and for Part I crimes, respectively. The symbols are presented in the context of the Crime Summary portion of the standard legend that routinely accompanied maps produced for

Public Housing Development Map Layer Buffers

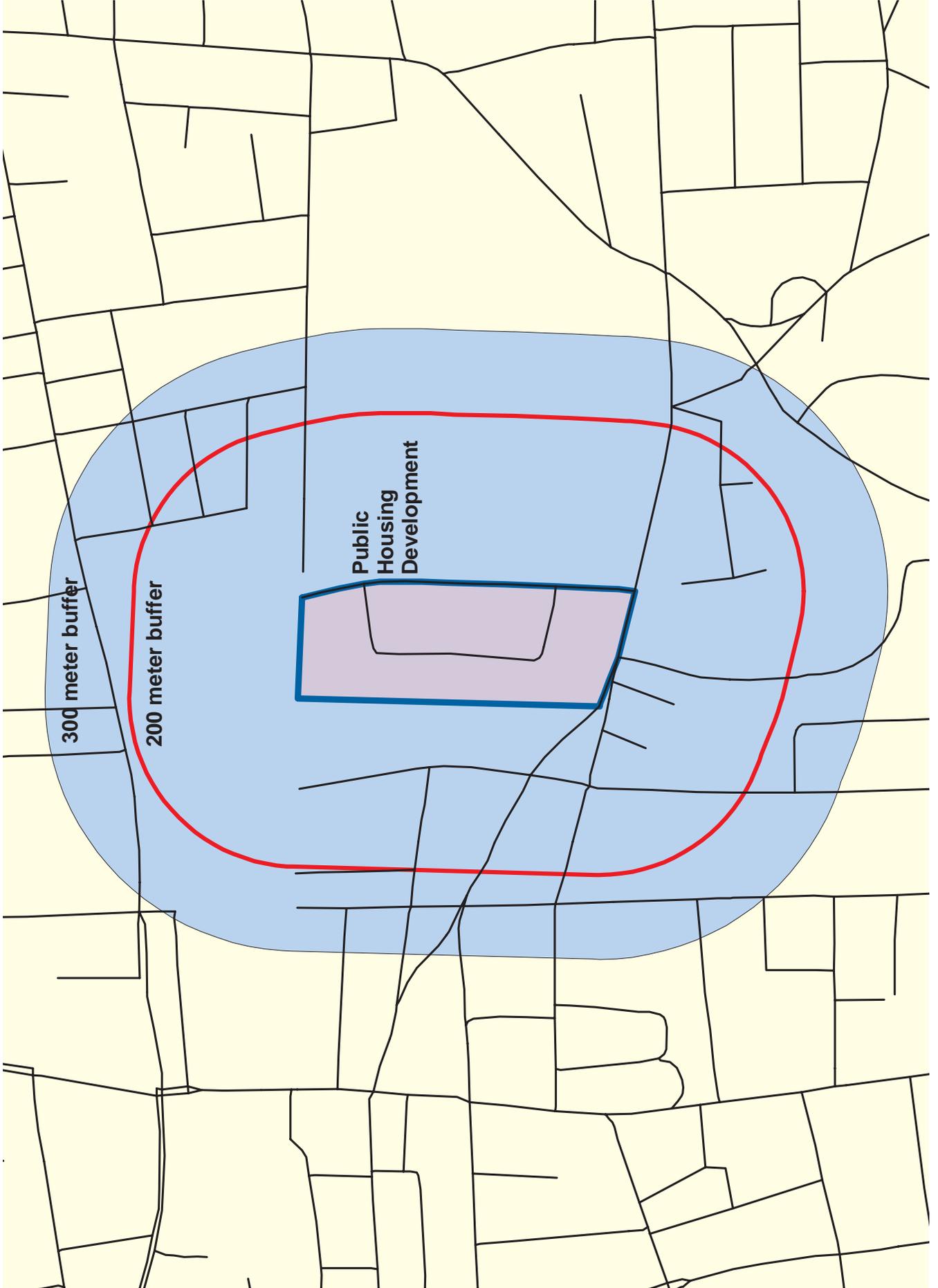


Figure 4

Figure 5

Public Housing Development Map Layer with Buffers and Police Beats

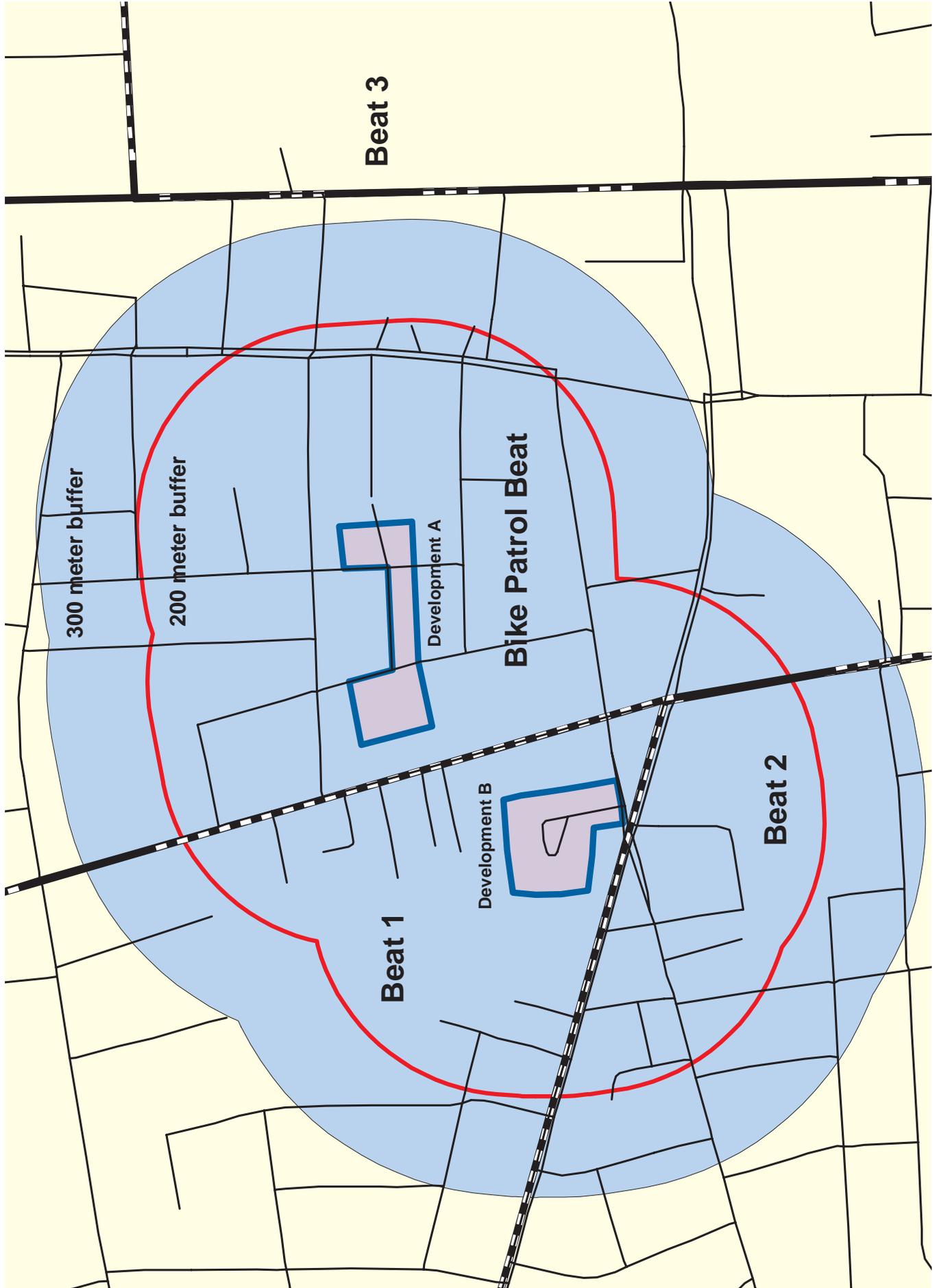


Figure 6a

911 Call Summary Table

Location	Number of Calls	Difference from Previous Month
Housing Development		
 Domestic Dispute	0	0
 Domestic Violence	0	0
 Narcotics/Vice Event	0	0
 Gunshots	0	0
 Suspicious Person	0	-1
 Suspicious Vehicle	0	0
Total	0	-1
300 meter buffer		
 Domestic Dispute	0	-1
 Domestic Violence	0	0
 Narcotics/Vice Event	0	0
 Gunshots	0	0
 Suspicious Person	0	0
 Suspicious Vehicle	0	0
Total	0	-1

Figure 6b

Reported Crimes Summary Table

Location	Number of Crimes	Difference from Previous Month
Housing Development		
 Murder	0	0
 Rape	0	0
 Robbery	0	0
 Aggravated Assault	0	0
 Burglary	0	0
 Larceny	0	0
 Motor Vehicle Theft	0	0
 All others	0	0
Total	0	0
300 meter buffer		
 Murder	0	0
 Rape	0	0
 Robbery	0	0
 Aggravated Assault	0	0
 Burglary	0	0
 Larceny	2	0
 Motor Vehicle Theft	1	+1
 All others	8	+3
Total	11	+4

CPPPs in our research. Most of the symbols themselves were obtained from a commercial “off-the-shelf” GIS package. Letters, numbers, or more abstract symbols could also have been used. The 911 Call/Crime Summary also allows the user to see any change in the incidence crimes from the previous month.

A variety of different crimes are displayed in Figure 7. A single larceny is shown to have occurred in Development B. An aggravated assault was reported as having taken place near the road connecting Developments B and C. Also, it is not unusual to have several incidents at the same address, especially if the address is a multifamily dwelling. In such situations, we used an “empty” marker and surrounded that marker with labels that indicated the type and number of occurrences of each offense. In Development A, four crimes were reported at the same address, i.e., one larceny and three “all others,” which is a catch-all for non-Part I crimes. Since public housing developments often contain large apartment buildings, each with a single address, it is reasonable to assume that the four crimes reported in Development A probably occurred in the same building rather than in the same apartment unit. The PD crime data file could be checked for the apartment unit associated with a particular reported crime.

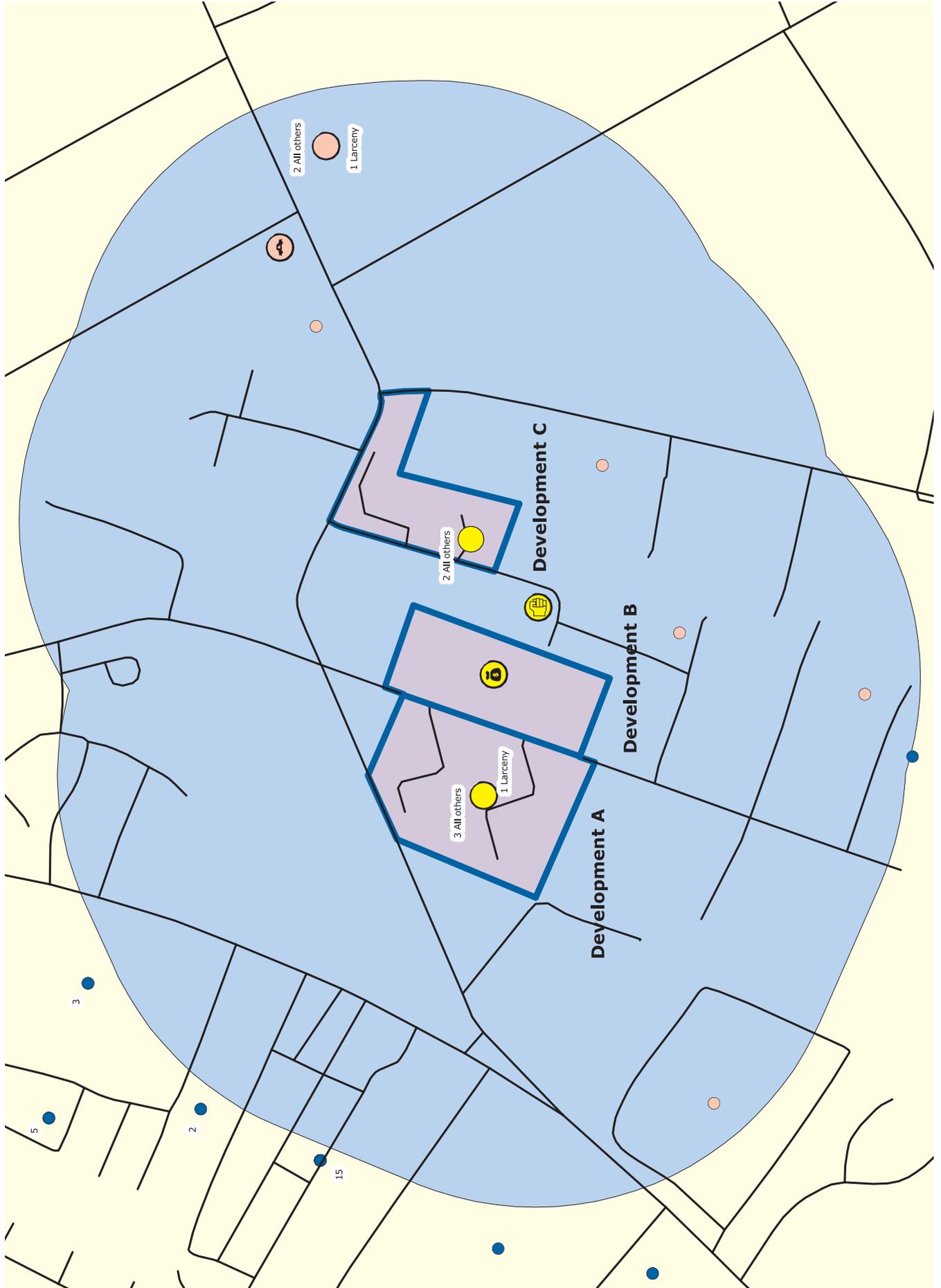
In the right-hand corner of the 300-meter buffer surrounding the developments portrayed in Figure 7, one sees a marker for car theft. In these buffer zones, we chose to depict the locations of single “all other” crimes with small empty markers and multiple crime locations with larger empty markers with appropriate labels. Beyond the 300-meter buffer, all crime sites were denoted with small empty markers plus a number if more than one crime was reported at a particular address.

Color as an Indicator

We recommend that the color used for offense symbols occurring in a PHA development be different from the color used for offenses reported to have occurred in the 300-meter buffer around that property. In Figure 7, we used yellow for incidents in the developments and pink for incidents in the 300-meter buffer zone. Offenses that occurred outside the 300-meter buffer were denoted by blue markers. Since the domain of interest depicted in each of our crime maps did not usually reach much beyond the 300-meter buffer, our small blue generic crime markers were almost always scattered along the periphery of the map. We noted, however, that these generic blue markers were sometimes useful in identifying hot spots that might have been having an impact on the public housing developments that were the focus of our CPPPs’ interest. For example, at the left-hand edge of the 300-meter buffer in Figure 7 is a blue dot with the number “15” adjacent, indicating a substantial amount of criminal activity at that address. If that address turns out to be a tavern or liquor store or crack house, efforts might be initiated to close it and thus literally wipe it off the map.

Figure 7

Public Housing Development Map Layer Displaying Crimes



Selecting the Types of Incidents to Map

Calls-for-Service and Reported Crime

With respect to crime analysis with GIS, one should consider whether to map calls-for-service (primarily 911 calls) or reported crimes. Both types of maps provide valuable information, and crime mapping partners with sufficient resources may wish to examine them both. However, we recommend that separate maps be generated for calls-for-service and reported crimes, respectively.

Interestingly, in some of its earliest incarnations, crime mapping focused on *drug arrests*. However, as stated in the 1999 guide, depictions of arrest data, especially with respect to illicit drug traffic, tell more about patterns of discretionary crime suppression activity than about the natural ecology of a particular crime problem. Drug arrests are actions that are initiated by the police who serve in a role analogous to that of complainant. In contrast, reports of serious crimes are most often initiated by private citizens, most of whom are the victims of the incident being reported. Therefore, maps of reported crimes are visual representations of predatory crime patterns, not patterns of police activity.

On the other hand, while calls-for-service also tend to be citizen initiated, these incidents do not generate as clear a picture of crime patterns as do crime reports by victims or victims' families. For example, calls-for-service sometimes involve reports of suspicious activity (e.g., strange people or motor vehicles) or disturbing or worrisome behavior in nearby public or private space (e.g., arguments, loud music, gun shots, screaming, traffic accidents, medical emergencies, etc.) Sometimes several calls will be received that may be responses to the same occurrence. In some cases, a patrol officer will arrive and informally solve the problem or, upon arrival, fail to detect the troublesome situation that initiated the call. In addition, patrol officers themselves may add to the log of 911 calls by requesting assistance from colleagues or other emergency services. Typically, the volume and variety of 911 calls far exceeds that of reported crimes. Certainly patterns of troublesome behavior do emerge from 911 calls-for-service, but the process of interpretation and analysis of this information differs from that involving reported crimes.

Mapping 911 Calls (Calls-for-Service)

Given the broad range of situations that serve as stimuli for 911 calls, it is important to be highly selective in choosing the types of calls that are to be mapped. During our research in one jurisdiction, we were asked to map over 50 different categories of events. The resultant maps were overloaded with information, and so few clear patterns were discernible. Our experimentation with 911 call mapping in several jurisdictions leads to the identification of six types of calls as among the most useful: domestic dispute, domestic violence, gunshots, narcotics/vice event, suspicious vehicle(s), and suspicious person(s) (See Figure 6a).

Mapping Reported Crimes

As with the 1999 guide, it is recommended that the Part I Index Crimes from the Federal Bureau of Investigation's (FBI's) Uniform Crime Reports (UCR) be mapped. Figure 6b displays seven of the eight Part I Index Crimes. Due to widespread reporting problems, arson is not included. As stated in the 1999 Guide:

Besides being generally recognized as including the most serious types of violent and property crimes, the FBI's Index Crimes were chosen for the following reason: The overwhelming majority of U.S. police agencies participate in the UCR crime data collection program and, therefore, use the same definitions for each of the Index Crimes. This uniformity of definition also extends to the crime statistics that participating PDs use in generating their own crime statistics. Therefore, Index Crime offense data represent the standardized depiction of crime, and their use allows for valid crime comparisons to be made across the highly diverse universe of law enforcement agencies in the United States.

Also important, PDs typically manipulate UCR in more or less standardized ways in order to calculate rates of reported crimes, e.g., statistical reports often present data as "crimes per 1000 population." Hence, meaningful comparisons of rates of particular offenses between cities or counties are possible. In summary, Index Crime categories and the associated rates are the "industry standard" for the measurement of crime in the United States; comparisons of Index Crime rates across jurisdictions are both reliable and valid. Therefore, their use also allows for meaningful comparisons of crime levels across PHAs and between types of housing in the public housing universe (e.g., specific types of developments such as high-rise versus low-rise), between PHAs, and between PHAs and other geographic entities such as neighborhoods.

Of course, one or both crime mapping partners may wish to map other offenses besides FBI Index Crimes. In addition to Part I Crimes (i.e., homicide, rape, aggravated assault, robbery, burglary, larceny, motor vehicle theft, and arson), maps generated in the latest phase of PD&R's crime mapping research included malicious damage, narcotics violations, and weapons violations. A catch-all category labeled "all others" was also used at one research site.

Shift Reports

Figures 8a and 8b show reports of calls-for-service and reported crimes, respectively, by date, time, and shift. We appended these tables to each of the crime maps that we produced. These tabular displays were among the most popular features with both PD and PHA staff. Police patrol officers were particularly interested in suspicious/criminal activity that had occurred on shifts other than their own, stating that such information gave them a more complete picture of events. Some saw these reports as helpful in focusing their attention on current or potential trouble spots.

Public Housing Development A 911 October Calls for Service Table

Within Housing Development			
ADDRESS	CALL	DATE	HOUR
1518 MAPLE BV	Domestic Dispute	10/02/01	17
3214 CORK ST	Domestic Dispute	10/04/01	12
2359 MAPLE BV	Domestic Dispute	10/06/01	1
3646 ELM DR	Narcotics/Vice Event	10/07/01	9
1255 LILAC DR	Suspicious Person	10/10/01	2
1299 LILAC DR	Suspicious Person	10/13/01	13
2345 ELM DR	Domestic Dispute	10/22/01	21
2259 CORK ST	Domestic Dispute	10/23/01	21
3321 MAPLE BV	Domestic Violence	10/31/01	4

Within 300 Meters of Housing Development			
ADDRESS	CALL	DATE	HOUR
2589 MAPLE BV	Gunshots	10/02/01	19
3207 ELM DR	Domestic Dispute	10/04/01	12
4412 MAPLE BV	Domestic Dispute	10/04/01	16
2935 MAPLE DR	Domestic Dispute	10/05/01	20
5678 ELM DR	Domestic Dispute	10/06/01	1
3036 LILAC DR	Suspicious Person	10/12/01	9
3312 REDWOOD ST	Suspicious Person	10/13/01	0
3026 CORK ST	Suspicious Vehicle	10/25/01	10
7421 PINE AVE	Domestic Violence	10/30/01	7

Time is represented as military time rounded to the hour

7:30am - 3:30pm
3:30pm - 11:30pm
11:30pm - 7:30am

Figure 8b

Public Housing Development A August Reported Crime Table

Within Housing Development					
CASE NUMBER	ADDRESS	CRIME	DATE	HOUR	
2001223998841	2359 MAPLE BV	Robbery	08/02/01	4	
2001215025984	2259 CORK ST	Larceny	08/03/01	19	
2001216000716	3214 CORK ST	Larceny	08/04/01	11	
2001217001152	1299 LILAC DR	Larceny	08/05/01	14	
2001225523358	1255 LILAC DR	All others	08/13/01	2	
2001220025789	3321 MAPLE BV	Burglary	08/14/01	7	
2001217000676	3646 ELM DR	All others	08/18/01	11	
2001216234565	1518 MAPLE BV	Motor Vehicle Theft	08/22/01	17	
2001216012455	2345 ELM DR	All others	08/30/01	22	
Within 300 Meters of Housing Development					
CASE NUMBER	ADDRESS	CRIME	DATE	HOUR	
2001216001191	2589 MAPLE BV	Motor Vehicle Theft	08/01/01	17	
2001216000716	3207 ELM DR	Burglary	08/04/01	14	
2001220001126	3036 LILAC DR	Larceny	08/08/01	12	
2001220000786	3026 CORK ST	Larceny	08/10/01	10	
2001223000278	5678 ELM DR	Robbery	08/11/01	4	
2001225000106	3312 REDWOOD ST	Aggravated Assault	08/13/01	5	
2001226000375	7421 PINE AVE	Aggravated Assault	08/14/01	7	
2001215002030	4412 MAPLE BV	Larceny	08/20/01	19	
2001216001997	2935 MAPLE DR	All others	08/23/01	20	

Time is represented as military time rounded to the hour

7:30am - 3:30pm
3:30pm - 11:30pm
11:30pm - 7:30am

Chapter 4. Managing Your Participation in a Crime Prevention Planning Partnership

Introduction

As indicated in an earlier chapter, the organizational arrangements and missions of PHAs and PDs are quite different. However, their respective interests and responsibilities do converge in the area of public housing crime prevention. Similarly, there would a natural convergence of interests between security managers for a shopping mall and the local PD. A stakeholder/PD partnership can take root in the exchange of information about the layout of a domain of interest and a shared commitment to crime prevention in that domain. A stakeholder/PD exchange on these issues also has the potential for crystallizing into a joint response to safety and security matters when representatives to CPPP meetings share their respective interpretations of crime maps. This chapter discusses strategies for launching and sustaining the actual face-to-face meetings upon which a successful CPPP is grounded.

Attendance and Meeting Space

The most obvious but most important determinant for successful interagency cooperation involves adherence to a regular schedule of meetings by the same core group of participants. Additional “new” stakeholder and PD participants should be welcome, but the same core group of representatives needs to be consistently present. Therefore, the day and time of the first and subsequent meetings must be carefully selected so that “no shows” are kept to a minimum. It might be advisable to set a term of membership such as 3 or 6 months to assist in advance planning. The actual frequency of meetings will be at least in part determined by the availability of successive iterations of crime maps (e.g., weekly, biweekly, or monthly). In addition, attendance is facilitated by the acquisition of a regular meeting space in a mutually convenient location. Our experience suggests that, if PD participants are amenable, a space at the local PD works best as it facilitates new police “drop-in” guests, some of whom may become the most appreciative consumers of the partnership’s crime maps.

Preparation for Meetings

Individuals who are representing their organization at CPPP meetings should receive “new” maps several days in advance of scheduled meetings. Our research experience suggests that it is not unusual for CPPP participants to minimize the importance of reviewing crime maps **prior** to the CPPP meeting. Again obvious, but by no means trivial, is the fact that these maps need to be carefully reviewed prior to arrival at the CPPP meeting. Such a review is not overly time consuming but is crucial to the success of the partnership. Below is a list of questions that a participant in our CPPP research e-mailed to colleagues prior to a new map review meeting.

- What do the maps show you?

- How do these maps fit with your perception/knowledge of concerns both in particular developments and their surrounding neighborhoods?
- Would these types of maps and shift breakouts of calls and offenses be useful to continue to receive?
- How do you see yourself using them?
- Would you like to have smaller version copies provided to you on an ongoing basis?
- How frequently would you like to see them (monthly, every two weeks, weekly)?
- What changes in the format, what's portrayed, etc. might be helpful to you?

Patrol Officers and Crime Maps

In the course of our research, we learned that, even in the most GIS-literate, technologically advanced PDs, crime maps may not be routinely shared with patrol officers. Therefore, do not expect that the officers who routinely serve your domain of interest (as patrol officers or community policing officers) will have access to the CPPP's crime maps. You may wish to approach commanders with a request that these line officers be invited to your CPPP meetings. Alternatively, you ask commanders to make available to these officers the CPPP crime maps associated with their beats or assignments. If you already meet routinely with patrol officers as part of your joint security responsibilities, then getting the appropriate maps to them for their review and feedback should not be difficult. However, do not assume that such crime map information "automatically" will become available to them through normal police channels because GIS maps often are not part of that day-to-day in-house communication. For example, during the course of our research, a senior police commander and a law enforcement program manager, both of whom were participating in a HUD-sponsored CPPP but not in the same city, chose to "decorate" police station office space used by patrol officers with the CPPP's crime maps. Wanting to share the GIS-based information with patrol officers, the commander and the manager independently resorted to a wall poster approach because no routine channel then existed to transmit such information. In both cases, the maps generated considerable interest and subsequent requests for more such maps.

Meeting without a New Set of Maps

Sometimes the press of daily business prevents the timely production of the latest iteration of crime maps. However, once a set of crime maps has been created for particular developments, useful CPPP meetings can occur without new iterations of these maps. The CPPP participants can exchange information on current safety and security issues, especially if recent offense and/or calls-for-service information by shift, day, and time such as shown in Figure 8b is available. Our research indicated that just the process of meeting regularly (even with "old" maps) led to valuable information exchange and helped participants better familiarize themselves with the area surrounding a development as well as with the development itself. For example, in one instance, new insights into long-standing crime patterns, including drive-by shootings, led to the diversion of vehicle

traffic away from an entrance to a public housing development. Even old crime maps can provide a new perspective on a hitherto unrecognized set of circumstances. In this same connection, it is important to note that the diversion of the traffic (some two blocks from the development) was suggested by patrol officers who, prior to our research, did not have regular access to crime maps.

Chapter 5. Technical Issues and Technical Assistance Resources

Introduction

Presented here are a number of “lessons learned” that help make data sharing with PD and the subsequent process of crime mapping as easy and straightforward as possible. Furthermore, at the conclusion of user guides to computers and software, one often finds a chapter on troubleshooting, i.e., what to do when or if certain situations occur. Since one of the primary objectives of this guide is to facilitate CPPPs, we also provide a small compendium of such helpful hints plus a short list of published work on crime mapping and PD/stakeholder partnerships. We also provide information on several Web sites where technical assistance is available gratis. Although this chapter does not contain an exhaustive treatment of technical issues, we hope that these odds and ends prove useful. Finally, the reader should be warned that several sections toward the end of this chapter are quite technical. However, we think that a general audience will find them readable. Beyond helping you understand and cope with the intricacies of managing crime mapping partnerships, this chapter may also help you to develop some empathy for the struggles that your GIS consultant and the PD’s crime analysis staff routinely face.

Police Data Files

An initial step in the formation of a CPPP involves getting crime data from the police. This is not always a simple, straightforward task. As noted earlier, your local PD will most likely feel uneasy about releasing such sensitive, detailed data. In order to facilitate data sharing, we strongly recommend that a formal data sharing agreement be drawn up and signed by both parties (See Appendix A). This agreement should specify how the crime data will be used and include agreed-upon safeguards for victims’ privacy. Another crucial element of the data sharing agreement is the amount of money to be paid to the PD for the staff time and other resources that are to be expended in the creation of the crime data files to be exported to the stakeholder or directly to the stakeholder’s GIS consultant.

Across the United States, PDs keep crime data in a variety of formats. Your PCs or those of your GIS consultant may have been bought with a standard database software package already loaded. Check with the PD to see if they have the same software, as this will make for a smooth start to the data transfer.

The quality and accuracy of your crime mapping heavily depends on the quality of the data provided by police. We found considerable differences in crime data quality and formatting style between police departments. Be prepared to have your GIS consultant edit the PD’s crime data to fit your needs. Be sure to ask for a “codebook” that defines and describes the data elements in both the reported crime file and the 911 calls-for-service files. It is likely that over time you will be receiving more than one batch of reported crime or 911 call data. Be sure to have your GIS consultant verify that each and every “new” data file matches previous ones with respect to codes and formats. This may

mean that the same set of edits will need to be executed every time a new batch is received. The editing is the stakeholder's responsibility as the PD is ostensibly happy with its own data files. Beyond just dealing with codes and formats, recording errors will inevitably be encountered in these files. Hence, your consultant should plan to visually examine each new file for obvious miscues such as misspellings and blank spaces.

Special attention needs to be paid to the manner in which crime types are coded as data entries. There should be a numeric or alphanumeric field in the crime data table, i.e., the PD data file, indicating the crime type. At the outset, it is helpful to run a frequency count of all the crime types to familiarize yourself with the classification style of PD. You may notice that a "new" crime type may appear in a particular batch of data. It may well be an "other" category related to the weapon used in an assault or homicide.

PD files may contain a high degree of specificity in the definition of major crimes. For example, aggravated assaults may be listed as discrete categories of offenses by type of weapon. This situation is likely to prevail for almost all Part I crimes. For organizational purposes and ease of mapping, we recommend that you create a set of "umbrella" crime types. For example, a code for all types of aggravated assault. Also, "attempted" crimes are often listed as discrete crime types and can be grouped with completed offenses when both have the same level of seriousness, e.g., Part I crime status. To be sure, check with the PD about the status of attempted Part I crimes in your state, i.e., are attempts counted as Part I offenses?

"Umbrella" offense categories notwithstanding, there should be some sort of unique identifier for each and every reported crime. Police often refer to this as the case number or crime number. It is important to preserve this unique identifier as a way of ensuring accuracy in crime counts. In this connection, be alert to duplicate crime records as these are not unusual (often in successive monthly data files). Here, the case number really is indispensable. An edit program can easily be written that looks for more than one instance of ostensibly unique case numbers.

BUT, almost inevitably, a crime incident will arise where several crimes were reported to have occurred at the same address, same date, and same time. The PD may assign the same case number to all of the reported crimes connected with the incident. Therefore, just to play safe, you may wish to create a new data element in your crime table/file using the PD's original case number. In effect, you can give all the crimes in your file a new unique case number, simply by adding a "zero" to the end of all case numbers to accommodate the possibility of this multiple crime situation. Then, when an instance involving several offenses arises, you will be able to sequentially number the crimes "1," "2," "3," etc. For example, if the case number data element originally had five digits (e.g., 33333), a sixth space (e.g., 333330) would be added. A multiple crime incident would then have the case numbers 333331, 333332, 333333, etc. Single crime incidents would still be unique; all would simply have an additional "zero," e.g., 333340. Of course, before adding sequential numbers to redundant case numbers, be sure to determine that different crimes and not clerical errors are involved.

With respect to 911 calls-for-service, we found that some police departments keep extremely thorough records and literally every call to the station is reported—both from field officers as well as by citizens. Therefore, 911 call records contain a good deal of administrative information that does not directly pertain to crime prevention such as “getting gas for cruiser” or “going on break.” Deleting these administrative entries will keep data files to a reasonable size, making mapping and analysis much quicker and easier.

In order to place the crimes on a map (i.e., the geocoding process), crime incident records must contain good address information. Hands down, this is the biggest factor in determining the accuracy of your crime maps as portraying real crime patterns. Address information is thus critically important to data quality. Quality of address information and the attendant style of recording addresses can vary greatly among police departments.

Most errors in address recording are usually easy to spot but will usually have to be edited manually since, while very common, such miscues often are one-of-a-kind bloopers. Addresses such as ‘South Center Mall,’ ‘Maple High School,’ and ‘Crescent Commons’ will have to be replaced with a numerical street address in order to be assigned a location on a map. Some address matching software will allow you to link these place names to their actual addresses via a device called an “alias.” In these instances, there is no question as to location of “the Mall.” Unfortunately, you may also see addresses recorded as just the street name without the address number. These records should be purged since one should not guess the location of a crime along a street.

Occasionally, a victim will visit a police station to report a crime or will report the crime at a hospital, having sought treatment from injuries inflicted during the victimization incident. In these instances, the address of the police station or hospital may be inadvertently recorded as the location of the crime. We suggest that the addresses of police stations and hospitals be checked against one’s data file so that these records can be purged from the data.

Verifying Crime Counts

Once the crime data file has been cleaned (e.g., incomplete addresses or administrative 911 calls removed) and edited (e.g., “umbrella” crime codes added), it is wise to have a look at the distribution of crime types to check for “normalcy.” For example, serious crimes of violence like homicide appear in most jurisdictions, so one might expect a small number of these offenses to occur. PHA developments (or any relatively small parcels of interest to community stakeholders) represent a tiny fraction of the land use in most jurisdictions, and so few murders are tallied in these areas, but the municipality itself is almost certain to suffer a few. If your jurisdictional crime data does not contain a particular type of Part I crime for several months (exclusive of arson, for which reporting is often complicated by delays associated with investigative activity), some research may be in order. Local newspapers are often a good place to begin. For example, if a type of serious violent crime is not present in your most recent police data download, but is

reported in a local newspaper, it would be prudent to follow up with a call to PD's crime analysis staff.

Also, note the frequency of occurrence of various crime types. Larceny is usually among the most prevalent of serious property crimes. In general, unless the data are coming from an exceptionally safe municipality, one is likely to encounter at least one of each of the eight Part I crimes with the possible exception of arson. In our experience, public housing building managers and/or the local PHA's security director usually will remember instances of serious violent crimes in or near public housing and perhaps a rash of car thefts or burglaries as well. Are these crimes present in the data provided to you by the PD? Some PD Web sites display updated monthly or annual crime statistics. Do these Web site numbers match with your data? **If you are receiving sets of data over several months and certain common crimes appear to be underrepresented, this should be a red flag that something may be amiss. Consider the possibility that you are not receiving complete data sets.**

The reader should note here that the receipt of incomplete crime data is likely NOT due to efforts by the PD to mislead stakeholders. Ironically, the PD's effort to keep its files current and accurate sometimes is the source of this file problem, since the updating process will keep file contents in flux. Sometimes there are several daily versions of updated and corrected files. Hence multiple versions of a reported crime file are likely to exist, and so a 2-day-old file may be old stuff. But, in reality, since crime mapping is usually about patterns rather than individual offenses, occasional minor shortfalls (while they do need to be corrected) are not likely to profoundly distort your maps. Furthermore, police investigators occasionally reclassify reported crimes in light of new evidence. **With respect to Part I crimes, one way to cope with the updating process is to request a cumulative file, i.e., a file that contains all of that year's preceding months' data so that you benefit from the constant efforts of the PD to maintain accurate counts.**

Older vs. Newer Police Systems and the Timely Transmission of Crime Data

As mentioned in an earlier section, data collection and recording systems vary greatly across PDs. In this connection, your data sharing partnership will have a greater impact on the resources of PDs with older systems. With older systems, it sometimes requires more programming input to generate the requested information. Coaxing an older system to perform will add to the burden placed on the PD's crime analyst(s). Thus the initial "shakedown" period for establishing timely transfer of data files may be longer where older systems exist and may even turn out to be a recurring problem. However, our research experience suggests that the presence of state-of-the-art technology at a PD does NOT guarantee that data transmission will be consistently timely. Sometimes, the promised data will just not show up on time, and people rather than machinery will need persistent gentle coaxing. Well-written, formal interagency data sharing agreements will help avert (but not entirely prevent) these rough spots.

Street Center Line Data and Geocoding

Given all things involved with crime mapping, locating incidents along a street network can be the greatest challenge. How well police personnel record addresses of crimes will directly affect how long your GIS consultant spends working to get at least 90–95 percent of the crimes located correctly on the maps. The quality and accuracy of street maps also plays an equally important part in address matching (i.e., geocoding) success rates.

Acquiring the most accurate, up-to-date street center line file helps ensure correctness in geocoding. Many good sources of such information exist. First, check with your local city or county government. Usually the most accurate and the most up-to-date, a street center line layer provided by city and county governments is often free and is increasingly becoming Web-based. Through its Web site, the U.S. Census Bureau represents another free source of street center line files, although the completeness of address ranges is sometimes less than ideal. In addition, there are several well known commercial sources of enhanced street center line files with national coverage. Street center line files can be read by most commercially available GIS software packages. Check with the geography department of your local college or university for recommendations in this regard.

Please understand that most recently compiled street center line maps are usually sufficiently accurate for geocoding but that it is virtually impossible to have an absolutely perfect, current street center line map layer. Staying up-to-date is especially difficult in metropolitan areas around rapidly changing urban centers such as Las Vegas, Atlanta, Houston, Denver, and Phoenix, where streets are built or expanded almost constantly. Street center line map layer providers just simply cannot update data fast enough. Given the fact that older cities experience their fair share of change as well, one should check the creation dates of any street center line files slated for use in crime mapping.

Specific Technical Hints on Address Matching

Address matching software is available in most off-the-shelf commercial GIS packages. But, although the process is automated, there is usually plenty of data preparation required with respect to the crime data provided by the PD. The goal is to have a single field in the data table per crime incident containing clean address information. By saying “clean,” we mean that the addresses listed will be easily and accurately interpreted by the address matching software.

For best results, every address record should consist of a correctly spelled, existing street with an address number that can reasonably be expected to exist on that street. ‘1234 Main St.,’ ‘6789 Oak Ave.,’ and ‘5532 Charles Blvd.’ are examples of clean and simple addresses. Unfortunately, not all the addresses in data provided by the PD are this tidy, and some editing will have to be done. Also, if a street has a North, South, East, or West directional prefix or suffix, make sure this is included in the address records for that street. Otherwise, a crime could end up being incorrectly located on the opposite side of town. Washington, D.C. is a perfect example of a city where address locations rely heavily on directional street naming.

You may receive data that has every element of the addresses in a separate field. Instead of a single field for '1234 North Main St.,' there will be a field with '1234,' a field with 'North,' a field with 'Main,' and a field with 'St.' These separate fields in the data table should be merged into a single field so that address editing and matching can be done smoothly. You will also find a good number of addresses represented as street intersections. Address matching software can interpret intersections if these records are represented correctly. The data from the PD may have records such as 'Main and Oak,' 'Evergreen at Maple,' or 'Kalarama Milham intersect.' These should be edited to conform to the format required by your address matching software.

Once you have cleaned up the crime data, added and removed fields and records, and completed any other editing, carefully look through a printout of the addresses and correct any obvious errors. This file will be processed by your GIS software, linking addresses with points on the map surface. The idea is to have the GIS crime data, i.e., the file as it appears in GIS database format, prepared and as error-free as possible before geocoding so as to avoid having to make further tedious edits later on. The resulting crime data layer (array of points on a map) should literally be a georeferenced snapshot of the crime data file.

Over time, the processing of successive batches of crime data may ease editing by revealing a recurring set of address recording anomalies. The following are some examples of what you may find. 'Northern High School'—this location may be obvious to most police officers, but it will not get address matched without a street number and name. 'Bldg 7 Knollwood Apts.'—apartment complexes commonly assign building numbers or letters, but the street address of the development is needed. 'Crosstown Shopping Center,' 'Northridge Mall,' 'Wal-Mart at Maple St.'—other examples where most people in the city know these locations, but a street address is required for geocoding. 'Apt 21 Oakwood Apts.'—just having an apartment number is useless unless a street address is included. 'Brightleaf Park'—an address along a bordering street of this park would help. As you can see, having a valid address is essential to accurate geocoding. The software will not know locations of shopping centers, schools, parks, particular stores, or apartment complexes on a street network. In such cases involving relatively easily recognized locations, however, you or your GIS consultant usually will be able to obtain the actual address with a minimum of effort.

Once the crime data file is prepared and geocoding is done, there will likely be a set of crime incident records that did not match with actual addresses. Before you begin to geocode a complete data set or re-geocode unmatched records, a graphic interface window can be popped open in your software and you may wish to alter a number of *preferences* (data processing options) that influence geocoding. For example, *spelling sensitivity* controls how much variation in spelling of the street names is allowed when searching for a match. Some other settings for geocoding are usually available in the software. You can specify a distance which the geocoded points will be *offset* from the street. This is recommended in order to have a more realistic looking map since homes, apartments, and businesses are not located directly on the street. Also, some software

packages will generate the actual “X and Y” map coordinates for your geocoded addresses. This feature can come in handy for obtaining precise frequency counts on small parcels or for distance studies.

Unexpected Good Fortune: Obtaining Geocoded Crime Data from the Police

If the PD with whom you intend to partner geocodes the crime data in which you are interested, why not simply request downloads of these “processed” data? We recommend obtaining geocoded data from the PD if they are available. In this situation, these data will arrive in a file format that your consultants can easily link to their GIS software package, thus saving the time, the money, and the aggravation of address matching. This strategy makes even more sense when one realizes that the PD’s crime analysts have probably gained considerable experience in coping with the idiosyncratic nature of local place names and street numbering schemes and have probably assigned an address scheme to uninhabited spaces such as parking lots, playgrounds, and parks. Therefore, the “hit rate” or proportion of correctly matched addresses should be excellent (i.e., approaching 100 percent correct).

Be optimistic but cautious. Trust but verify. Our experience indicates that the accuracy and completeness of both “processed” (i.e., geocoded) and “raw” crime data (a conventional database) needs to be checked. The accuracy of geocoded data can be influenced by the particular GIS software that was used. Another important factor is the accuracy of the street center line file used in conjunction with the crime mapping process.

It would be prudent to ask your consultant to check the quality of the initial download of geocoded data. Also, you should request a copy of the street center line file that the PD uses for its crime mapping. If there is dissatisfaction with the PD’s geocoding, your consultants can simply apply their own software and, perhaps, another street center line file. Again, remember that the PD was engaged in crime mapping before you arrived and is ostensibly pleased with their maps. You, however, are free to invest in refinements to the PD’s data, if your consultants deem it necessary and the money is available to pay for this work.

Cartographic Display

In the course of our field research with PHA/PD CPPP, a good deal of time was spent on the design and creation of maps, i.e., cartography. Several important lessons emerged from these cartographic exercises. Above all, keep the maps simple. The simpler, the better. Cluttered maps showing too much information do little to capture viewers’ attention. Sensory overload and frustration follow. In essence, an overly “busy” map may fail to answer the fundamental question: what is the crime pattern in and around this development? Locations of crimes should be the main focus. As you can see from the maps in this guidebook, we highlighted crime locations, individual developments, and the 300-meter buffer. Other features like the surrounding streets are somewhat subdued. Labels are kept to a minimum.

Color choice and choice of symbols support the basic mission of the maps to portray the presence or absence of crime patterns. An effort was made to render colors and symbols pleasing to the eye. Soft, light colors seemed to work best. Likewise, simple, easy-to-distinguish symbols were used for identifying crime types. Neat, easy-to-read fonts such as Arial or Verdana were used for crime labels and any other text on the maps other than the title. In some GIS packages, a “halo” effect (text surrounded by a white or shaded area) can be used to highlight small text such as labels for multiple crimes occurring in one location and crime frequency labels. A light, earth-tone background color was chosen as a backdrop to the streets, crime symbols, developments, and buffers to help accentuate these central elements of the map. Other parts of the map containing the legend, crime summary information, and any supporting graphics or notation were placed in what amounted to a sidebar.

Balancing the Central Elements of the Map With Other Information

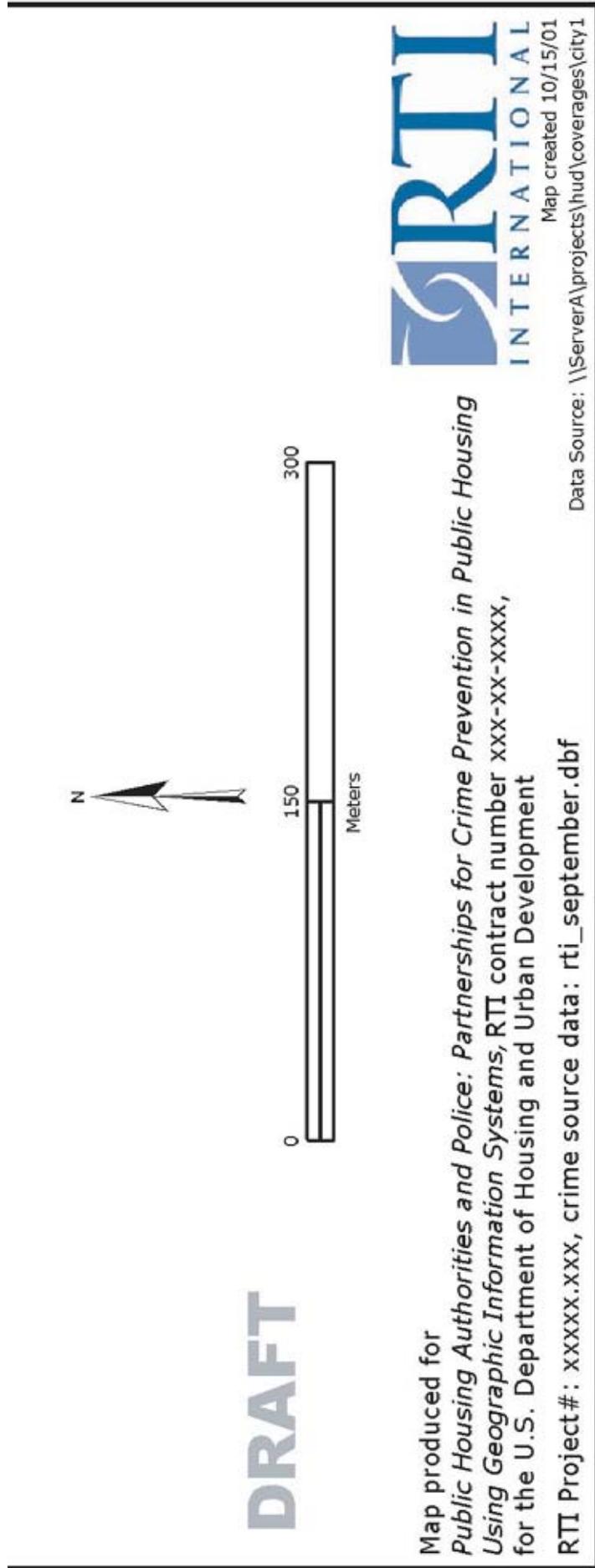
It may be helpful to the viewers of your maps to see some of the area adjacent to the 300-meter buffer around a development. For example, roads carrying vehicular traffic toward the development are sometimes important. In such instances, you might wish to experiment with zooming out a bit from the buffer to capture what might be key local infrastructure. The problems of a particular development may be fed by traffic patterns. We found that, when crime maps guide CPPPs toward genuinely understanding local problems, joint PHA/PD solutions are more likely to emerge. In addition, if you choose to add a summary table to your maps as we have done, be sure it is aligned and orderly, especially with respect to crime symbols. The summary table can also serve as a legend for the calls or crimes.

More Cartographic Hints

Well documented crime maps also need to contain a great deal of information beyond the central elements elaborated upon above. The title should be instantly visible, short, and let the user know the “what, where, and when” with respect to the data mapped. For example, “Oakwood Housing Development—Lake County, Minnesota, September 2001 Crimes,” follows the rule of “what, where, and when.” A legend for symbols should be included and be easy to read. A scale bar indicating the size of the parcel at hand should be placed at the bottom of the map. Labels for streets, crimes, or any other items should be large enough to easily read but not so large that the lettering begins to mask the crimes. Since CPPPs tend to generate many maps, the very bottom of the legend/summary sidebar should contain (in very fine, small print) notes as to data sources, map file identifiers, and the date the map was made (See Figure 9). Be sure to add your agency logo in a lower corner as well. In addition, a border or several borders around the map helps bring all the elements together in a neat and tidy manner. Conversely, avoid getting too elaborate, or people will notice the border design more than

Figure 9

Map Notes and Associated Reference Information



your map. This point is applicable to almost every piece of information on the map except the central elements, i.e., the crime locations and types of crimes.

Hardware

In large part, the visual quality of your maps depends on the quality of your plotter (i.e., printing device). However, the most expensive plotter is not needed to print a quality map. Less expensive machines are available that can do a fine job. There are many good large-scale plotters on the market. If your agency is planning on acquiring a plotter, consider ease of maintenance and its reputation for trouble-free operation as well as its ability to produce sharp, clear images. Plotters that can hold a 36" or a 42" roll of paper are well suited to crime mapping since they allow for the production of maps of sufficient size for the task at hand. Larger plotters obviously offer more latitude in map size selection.

In our research, we have found a 22" x 17" map size is satisfactory for most users. It is small enough to handle, yet big enough to tell the story. Police officers may want to have smaller, more portable photocopies for easier handling in their cruisers. Besides printed maps, users may want electronic versions for archiving, for future viewing, or for printing multiple copies. Commercially available GIS software can export maps to formats such as Joint Photographers Expert Group (JPG), Graphic Interchange Format (GIF), Bit Mapped Picture (BMP), Portable Document Format (PDF), and other graphic file formats. These files can then be stored on a CD-ROM and easily delivered. Overall, we recommend PDF format because of the small file size and high image quality.

Software

A wide variety of good-quality GIS packages is commercially available. And, specifically with respect to crime mapping, a large selection of software is available made specifically for such mapping and related analysis. With grant support from the U.S. Department of Justice, The Police Foundation prepared and has subsequently published *Users' Guide to Mapping Software for Police Agencies* (2000). The guide discusses a range of software options and is available free via the Internet.

The CPPPs studied in our research did not use—nor did they appear to need or did they ever request—any statistical analysis beyond crime counts. Simply put, such analyses may not be needed. We are pleased with the fact that the maps in our research were successful in their role as facilitators for joint planning. However, this having been stated, it is also important to recognize that a good deal of software exists to assist crime mappers to analyze their data. CrimeStat is a popular crime mapping software package and is free to download from the Internet. It is a spatial statistics program for the analysis of crime incident locations, developed by Ned Levine & Associates under grants from the Department of Justice's National Institute of Justice (NIJ). It provides statistical tools to aid law enforcement agencies and criminal justice researchers in their crime mapping efforts. With support from NIJ's Crime Mapping Research Center (recently renamed the Mapping and Analysis for Public Safety Program), the Environmental Systems Research

Institute (ESRI), a private sector corporation, has created the Crime Analysis Extension for ArcView 3.1 (the latter being a commercially available ESRI GIS package). Crime Analysis Extension is a free software application, designed to provide easy-to-use tools for geographic crime analysis, data management, mapping, and reporting. Another NIJ funded, free application from ESRI is the Community Policing Beatbook. It gives access to electronic maps that display information about the community, tools for recording and mapping information, as well as search and query functionality, and is designed for use either in the field on a laptop or an in-car computer, or at the police station. In addition, there are many other new easy-to-use crime analysis software products commercially available.

A Word about Customizing and Automating Crime Map Production

Your agency or organization's particular crime mapping needs represent the customization of a handful of GIS procedures. Once successfully executed upon the first batch of crime data, the customization process is largely finished. It is likely that your maps will have some sort of standard layout design. The title, borders, legend, crime summary table, scale bar, and other graphics will be in the same location on each map. Also, base map data layers such as streets, city, county, police jurisdiction, or beat boundaries will in large part remain constant. With few exceptions, only a handful of changes will occur with respect to the particular domains of interest under study, such as the surrounding buffers and the crimes or 911 calls of interest. The only principal component of the mapping process that will change will be the downloads of crime data, periodically received from the PD. Therefore, we recommend that automated procedures be developed that will create routinely used maps with very little input from the stakeholder (i.e., the end user). In fact, most GIS software packages permit the creation of these automated procedures, sometimes called "macros" or "scripts." Of course, while a "macro" will automatically map new data, you may have to manually change the date in the title and the contents of the crime summary table on successive editions of the same basic map.

Again, we recommend that a GIS consultant be hired to do this work. Once the customized maps and analysis have been programmed in a script, these tasks can be repeated quickly at minimum cost. The customized programs can be strung together, in effect automating the process. In sum, this entire process can be described as front-end loaded. Once your agency or organization's crime mapping has been programmed, you are then free to focus the analysis of crime patterns and crime control planning.

How Our Crime Maps Were Produced

Once we established a standard map design and identified the data layers (types of data) and other information needed as periodic input for each map, work went forward in programming a customized, automated process. For this project, ESRI's ArcMap program (a component of the ArcGIS software suite) was used to create the maps. This Windows-based software comes with the Visual Basic for Applications (VBA) customization interface and the ArcObjects language library. ArcObjects, an ESRI

product, is a large collection of object-components that complements the Visual Basic programming language used in VBA to customize ArcMap. ArcObjects was used to create separate, stand-alone mapping programs. Graphic user interfaces (e.g., the common forms, menus, dialog boxes seen in MS Windows software) were programmed, based on the desired mix of items to be visualized, to create a series of maps.

For our work, ArcMap was customized so that a form appears where the user selects from a list of the city's public housing developments and then selects a month. Once the selections are made, the application adds the appropriate data layers and labels, zooms to the correct mapped area, changes the title, and calculates other corresponding crime information. The result is a map of the selected public housing development showing crime activity and statistics for the selected month.

Published Resources

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Weisel, D.L. (1990). Tackling Drug Problems in Public Housing: A Guide For Police. Police Executive Research Forum, Washington, D.C.

Web Sites

HUD E-Maps: <http://www.hud.gov/emaps>

Locate public housing and nearby environmental information nationwide.

The U.S. Department of Housing and Urban Development offers an array of GIS-related reports

<http://www.huduser.org/publications/pubasst/gis.html>

National Institute of Justice's Mapping and Analysis for Public Safety:

<http://www.ojp.usdoj.gov/nij/maps/welcome.html>

Formerly known as the Crime Mapping Research Center. Good information about crime mapping. Listings of publications, software, and many Web sites.

ESRI's free Crime Analysis Application Extension for ArcView 3.1:

http://www.esri.com/industries/lawenforce/crime_analysis.html.

ESRI's free Community Policing Beat Book software:

<http://www.esri.com/industries/lawenforce/beatbook.html>.

CrimeStat II, free crime mapping and statistics software:

<http://www.icpsr.umich.edu/NACJD/crimestat.html>.

Appendix A

Sample Memorandum of Understanding

“Public Housing Authorities and Police: Partnerships for Crime Prevention” RTI Project No. XXXXXXXX

Research Triangle Institute (RTI) requests the assistance of the _____ Police Department in completing the U.S. Department of Housing and Urban Development’s study, “Public Housing Authorities and Police: Partnerships for Crime Prevention,” in the following areas:

- Provide RTI with periodic (biweekly or monthly) files of 911 calls-for-service and/or crimes reported to police. Files of crimes reported to the police should, at a minimum, contain a crime incident identifier, crime type, incident address, incident date, and time. These files can be submitted in a variety of formats including comma delimited files, dBase, Excel, or Access. The files should contain crime data for the entire city. RTI will be responsible for processing the file to analyze crimes in and around public housing.
- Use crime maps and associated statistics generated by RTI in planning and coordination of their crime prevention activities with the _____ Housing Authority. Regularly review (biweekly or monthly, for example) the crime maps and associated statistics and coordinate their use with the _____ Public Housing Authority.
- Provide feedback to RTI regarding the success of the project in fostering coordination between the _____ Police Department and the _____ Public Housing Authority and in using the crime maps and associated statistics in an attempt to prevent crime in and around public housing developments.
- (Financial Details placed here, e.g., how much will be paid, when paid, how paid).

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