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GEOGRAPHIC BASE FILES IN LAW ENFORCEMENT: Assessments of Selected Projects With Recommendations for Future LEAA Action

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ABSTRACT

This report by SRI International examines the technology of geographic base file (GBF) systems usage by law enforcement agencies. The scope of the report is limited to reviewing the present use of the Bureau of the Census DIME file as a GBF with emphasis on a project sponsored by LEAA in 1974-1977. Site visits were made to the previous contractor and to two cities for evaluation of GBF software and experiences.

The Census DIME file and associated Correction, Update, and Extension (CUE) process are deemed adequate as a basis for developing law enforcement derivative GBFs. GBF technical and project planning information and tools were not considered adequate for local law enforcement agencies.

Recommendations are presented to:

- Create a management planning package for GBF projects.
- Develop two new GBF software tools.
- Determine the feasibility and specifications for an x-y coordinate digitizing package and a GBF data base microcomputer.
- Develop GBF information resources and user communications.
- Furnish technical assistance for GBF projects, applications selection planning, and CUE troubleshooting.

The recommendations are organized into three major GBF program areas for LEAA: information broker, technical assistance coordinator, and GBF tool developer. A plan for immediate action is also suggested.

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EXECUTIVE SUMMARY

A. Purpose and Scope

This report examines the technology of geographic base file (GBF) systems usage in law enforcement agencies. The scope of this report is limited to reviewing the present use of the Bureau of the Census DIME (Dual Independent Map Encoding was developed by the Bureau of the Census as a method of representing maps in a computer usable form) file as a GBF with emphasis on the results of a two-phase project sponsored by the Law Enforcement Assistance Administration (LEAA) in 1974-1977. Recommendations are presented for GBF policy and program development.

B. Data Collection and Analysis

Data collection for this project consisted of background site visits, GBF-user site visits, and telephone contacts with other GBF or DIME users. Visits to the International Association of Chiefs of Police (IACP) and the Bureau of the Census provided background information on the earlier GBF project and additional details on DIME software, file developments, and maintenance policy and practice.

Site visits were made to St. Louis, Missouri, and Tucson, Arizona, to hear the views, experiences, and problems of law enforcement GBF users who had participated in the previous project. The two cities provided considerable variety and contrast in their approaches to GBFs. The information from all these visits was correlated with other GBF experiences known to the project team.

Visits to St. Louis and Tucson are summarized in Chapter II. Chapter III presents and interprets the information obtained as a series of observations and findings.

C. Recommendations

Our recommendations to LEAA, organized by topic area, are presented in Chapter IV. Briefly these recommendations are:

- o Suitability of the DIME file for GBF work
  - Continue to support DIME for law enforcement. Require strong justification for non-DIME GBF projects.
  - Use DIME standards and procedures for agencies not within a standard metropolitan statistical area (SMSA) who wish to develop a GBF.

- Management planning
  - Develop a workbook-type planning package to use in examining feasibility, planning, scheduling, costing, and benefits of GBF/DIME projects.
  - Establish specific guidelines and criteria for use in allocating LEAA GBF/DIME assistance.
  - Continue developing an inventory of existing GBF law enforcement computer applications as a companion to the planning package above.
  - Provide limited short-term technical assistance for project, management, and applications selection planning.
  - Establish informal contacts with other federal agencies who support DIME so as to coordinate development.

- Creation, update, and extension (CUE) of DIME files
  - As the current CUE process seems to meet law enforcement needs, no new developments are required at this time.
  - Furnish technical assitance for CUE troubleshooting.
  - Pursue the feasibility of an automated x-y coordinate digitizing package to remove a bottleneck in the existing CUE process.

- GBF software support
  - Do not support the REFORMAT software any further. (See Appendix A for a description of the components of the REFORMAT software.)
  - Replace the POLYGON program with a more efficient, usable version. (See Appendix A for a description of POLYGON.)
  - Develop a program to update coordinates on a DIME file.

- o DIME applications

  - Develop a library of technical materials including GBF bibliographies and applications designs.

  - Develop adequate two-way communications with users through workshops, user groups, technical assistance, and use of a "hot-line" telephone.

  - Provide technical assistance for file creation and GBF applications development, but do not develop generalized file access software.

  - Determine the feasibility of, and, if possible, the general design of, a GBF data base microcomputer system that would combine storage and access functions.

D. Continuity of a GBF Program

Before implementing any recommendation, it is important that LEAA consider the continuity and duration of support it wishes to furnish a GBF program. Because user development of a GBF and its applications can take from 1 to 4 years, LEAA services should be availible during that time. Otherwise user perception of services would be poor, negating the effects of developing exemplary GBF products and services. Therefore, we believe LEAA should not enter a GBF assistance program unless it reasonably expects to support the program continuously for at least 4 to 5 years.

E. Possible LEAA Roles in GBF Support

We have developed three possible roles for LEAA to choose from in support of GBF development and use. These roles are information exchange, technical assistance, and development and dissemination of GBF technical products. The above-stated recommendations have been reorganized to fit within these roles:

- o Information exchange

  - Develop a project planning package.

  - Develop an applications selection package.

  - Coordinate with other federal agencies.

  - Develop technical documentation.

  - Establish two-way communications with users.

- o Technical assistance
  - Develop a local support methodology.
  - Provide planning and applications selection technical assistance.
  - Provide CUE technical assistance.
  - Provide applications development technical assistance.
- o GBF tool development
  - Develop software to insert geocodes and coordinates into DIME files.
  - Study feasibility of developing a coordinate digitizing package.
  - Study feasibility of GBF data base microcomputer system.

F. A Program for Immediate Action

To respond rapidly to perceived user needs, we have formulated an initial program of action items that can contribute to longer-term support, will directly benefit users, and should be able to be completed within 6 to 9 months. The recommendations fulfilling these requirements are:

- o Develop the project planning package.
- o Develop the applications selection package.
- o Study feasibility of developing a coordinate digitizing package.
- o Study feasibility of developing a GBF data base microcomputer system.
- o Provide directed technical assistance.

CHAPTER I. INTRODUCTION

A. Geographic Base Files in Law Enforcement

Law enforcement agencies have traditionally made extensive use of geographic references in organizing operational and management information. The basic motivation for geographic analysis is to provide both planning and operational information for use in managing police forces and improving service.

Prior to automation, geographic analysis was limited to aggregating and reporting event and service data by geocodes manually inserted into reports during the report preparation or analysis process. This has always been an error-prone method with long delay times usually occurring before reports are available to decision makers. Another method of geographic analysis was via the "pin map," which was also slow and limited in the types of data displayed.

Since the early 1960s, the information process has become automated through the application of computers to police information systems. Because of the relationship between geography and police services, there has been a rapidly growing trend toward systematizing geographic references for uniformity of information processing. As a basis of this processing, uniform systems for representing the geography of a jurisdiction, called geographic base files (GBFs), also appeared. Among other uses, these GBFs provide the link to convert the reported address or location of an event to equivalent geocodes (police beat, reporting area, and so forth) or to coordinates for display on computer generated maps.

GBFs have become key tools in the cost-effective implementation of a wide variety of law enforcement operational and management information systems. As computer-based information systems have been appearing in medium and small departments, so have geographic related information systems. Some examples of applications using GBFs are:

- Crime statistics
- Event location mapping
- Crime analysis and investigation
- Computer-aided dispatching
- Automated vehicle monitoring

- o Resource allocation, including:
  - Beat reconfiguration
  - Watch scheduling and deployment
- o Traffic analysis.

Without automated GBFs, much of the timeliness and capability of these applications would not be possible--manual geocoding has been shown to be inefficient and error prone. Indeed, many agencies are changing from batch to on-line GBFs to provide the benefits of even faster geographic data capture, analysis, and reporting for use in short-term tactical deployment and operations.

Many past and current Law Enforcement Assistance Administration (LEAA) projects have included the development of GBFs. However, there is no systematic accounting of the costs related to GBF development because both GBF-only projects and projects that have included GBF development as a subtask, such as computer-aided dispatch (CAD), have been conducted. Certainly, very substantial sums have been expended in this area.

At present, the following points concerning the usage of GBFs are clear:

- o GBF applications are widespread and meet many varied needs within law enforcement agencies.
- o Law enforcement operations, planning, and management personnel rely heavily on GBF applications for geographic analysis and reporting.
- o Criminal justice and other local government agencies are interested in developing, maintaining, and applying GBFs to local requirements for geographic analysis and reporting.
- o There has been much ongoing LEAA activity and support for GBF development.

These factors indicate that GBFs are very appropriate for continued LEAA attention and support.

B. Study Background

During the 4-year period ending in May 1978, the International Association of Chiefs of Police (IACP) performed work on two contracts for LEAA that had as their objectives:

- o Determination of the extent and use of GBFs in law enforcement.
- o Design of a uniform basis for systems development.
- o Provision of assistance in GBF applications for local law enforcement agencies.
- o Dissemination of GBF documentation and information.

As a result of this work, documentation was published describing GBF designs, issues, and surveys of their use and applications. Additional documentation was published in conjunction with 16 GBF workshops and two user group meetings. Early in the project, IACP had the Geography Division of the Bureau of the Census develop a software package for producing law enforcement derivative DIME files. (Dual Independent Map Encoding was developed by the Bureau of the Census as a method of representing maps in a computer usable form) The eight programs in this package are known as the REFORMAT programs, and they are summarized in Appendix A. The software package was disseminated to the St. Louis, Missouri Metropolitan and the Tuscon, Arizona Police Departments for installation and testing. Ten other police departments were provided with on-site technical assistance and about 400 technical assistance and reference requests were provided through a toll-free telephone. The geocoded statistical systems of 10 agencies were documented.

C. Purpose of This Study

Given this groundwork, LEAA wished to examine the technical issues of whether the GBF software and the DIME file structure are adequate for law enforcement usage and whether any existing impediments to the use of DIME can be cost-effectively eliminated through modification or enhancement. In addition, LEAA wished to collect further follow-up information on the two sites (Tucson and St. Louis) where the IACP/Census software was tested using actual DIME files.

SRI was to evaluate the experiences of local agencies with GBF files to determine whether local requirements could and would be satisfied with DIME. Existing problems regarding the creation and use of DIME files were to be documented so that activities appropriate to LEAA could be identified.

D. Study Methodology

To develop the required information in an organized manner, SRI first developed a comparative analysis design. This task included developing an interview guide for use at the two GBF

evaluation sites, gathering a reference library of GBF materials, and visiting the IACP and Bureau of the Census to discuss previous GBF project work.

Site visits were made to the St. Louis and Tucson police departments to learn of their experiences with the DIME files and the IACP/Census DIME file manipulation software. Follow-up contact was made by telephone to fill in gaps in the initial data collection and to informally contact other sites to confirm the analysis findings. This document summarizes and analyzes the information collected.

The information sought via the interview guide was generally obtainable, with one exception: Information on the cost of developing, updating, maintaining, and using the DIME files was generally not available in a form that could be readily obtained. Development of these costs and other project information that would be useful for planning GBF projects at other agencies is discussed in Chapter III.

E. Report Organization

Following this introduction, the visits to St. Louis and Tucson are discussed separately in Chapter II. Each site is discussed in terms of the relationships among the various agencies involved with the DIME file, DIME development, maintenance, and applications, and the site users' experiences with the IACP/Census software.

Chapter III presents the information from the site visits and other GBF contacts in a series of observations of problem areas. Each observation is followed by findings that identify the specific problem and discuss alternative solutions. Chapter IV extends the findings of Chapter III by presenting specific recommendations for appropriate LEAA action.

Chapter V reorganizes the recommendations so as to present LEAA with a set of program areas to be considered for implementation. The program areas of information broker, technical assistance (TA) coordinator, and GBF tool developer are identified and discussed. Chapter V also presents an action program for LEAA that suggests which specific recommendations can be implemented rapidly in order to provide immediate support to local law enforcement users. Furthermore the necessity for continuity of LEAA support to a GBF program is discussed.

Appendix A describes the REFORMAT software and Appendix B lists all contacts made during the background and site visits. A glossary and bibliography are also provided.

CHAPTER II. SITE VISIT SUMMARIES

A. St. Louis

1. The agencies involved. The Bureau of the Census has designated the East-West Gateway Coordinating Council (EWGCC) as the local correction, update, and extension (CUE) agency. EWGCC is a regional association of governments in the Illinois and Missouri areas around St. Louis. EWGCC used the Urban Information Center of the University of Missouri - St. Louis (UMSL) to perform CUE computer processing and plotting.

The St. Louis Metropolitan Police Department (SLMPD) and other local law enforcement agencies have used geocodes for a long time. Generally these geocodes are inserted manually into reports by the report writer. Since 1965 SLMPD has maintained a computer geographic base file called the Wurdack system. Addresses in reports are manually converted to a New Location Code (NLC), which is converted via the Wurdack file to local geocodes. These geocodes are appended to event records for statistical and trend analysis.

Two other geocode files exist for the city of St. Louis. SLMPD has an automatic vehicle location (AVL) system called FLAIR which displays police vehicle locations on a computer produced street map. The geofile used for this application was developed independently of DIME and is now proprietary to the FLAIR system vendor.

Another geocode file will exist within the 911 system now under design and development. As part of 911, the local telephone company is developing its own proprietary geographic base file for converting telephone number to address and address to the Public Safety Answering Point (PSAP) for dispatch or for call routing to an emergency service number (ESN). The telephone company is being aided by the St. Louis County Office of Civil Preparedness and the City of St. Louis Crime Commission in verifying street address ranges. The 911 geofile is being developed independently of DIME and is being funded as part of the 911 project with matching local and federal funds.

General-purpose computer resources for SLMPD are furnished by the Regional Justice Information System (REJIS) via a remote job entry station. REJIS is a consolidated computer system serving law enforcement, courts, jails, and other criminal justice users in St. Louis and surrounding Missouri counties. REJIS has a copy of the Wurdack file and updates it on the request of SLMPD. It does not have a copy of the DIME file and has no immediate applications requiring the DIME.

Other users of geofiles in the St. Louis area include the regional transportation planning agency and the city street and fire departments. The city data processing department is the repository of the Wurdack file for users other than SLMPD. UMSL has an active program using GBFs and data related to geography. It uses DIME files, Bureau of the Census statistical data, and geographical data from other sources. The program at UMSL includes software and procedures for DIME updating, access, and plotting.

2. DIME development. As the CUE agency, EWGCC handled the DIME development. However, its responsibility extended over multiple counties in two states, including many fast-growing suburban areas. EWGCC performed map and DIME file updates in preparation for the 1980 census using approximately three persons over the past 3 years.

No local agencies committed independent resources to assist EWGCC with DIME updating, nor was any informal coordination and resource sharing evident. SLMPD did establish a small project to independently check the DIME file for the city of St. Louis. Other agencies were not interested in DIME, were waiting for EWGCC to finish its update of the DIME, or were attempting to create a geographic base file from other data sources such as assessors' records, voting records, and aerial photomaps.

3. Law enforcement use of IACP/Census technical assistance and software. The SLMPD procedures for establishing a geographic base file with the St. Louis DIME file called for inserting police geocodes into the DIME file, stripping the DIME file to eliminate unused data, creating an intersection file, and creating subsystem files of common place names, commonly misspelled names, multiple street names, and so forth. Prior to these steps, SLMPD tested the IACP software on the test files provided with the REFORMAT software package. The routine errors were fixed with the help from IACP and the Bureau of the Census. These tests are documented in the 1977 IACP report "GBF Test Site Descriptive Report."

Several problems developed that prevented SLMPD from building an actual police geofile. The most formidable problem was the requirement that the program used to insert local geocodes (POLYGON) only operate on DIME records where accurate, complete coordinates are present. This is virtually impossible, especially where the DIME file is being corrected and updated; coordinates are the last and most time-consuming items to insert. Thus, SLMPD never got past the first step in its procedures because it spent the available time attempting to clean the coordinates instead of seeking alternative methods for inserting geocodes.

4. Law enforcement and other DIME applications. The DIME file is used infrequently in the St Louis area, especially by law enforcement. The primary potential application for DIME in the SLMPD is to replace the existing Wurdack system. DIME offers more flexibility and would eliminate the errors inherent in the manual coding step. The DIME file would be used to geocode events for statistical and planning applications. SLMPD is also currently involved in the Police Automated Radio Record Information System (PARIS) study. The study objective is to streamline the capture and processing of dispatch information. The DIME file is being considered for converting addresses to geocodes in this process.

The St. Louis County Police Department is designing a CAD system that will require the use of a GBF to translate addresses into County Geographical Information System (COGIS) areas (equivalent to police reporting areas) for the dispatch process. Because of the uncertainty about the quality of the St. Louis County portion of the DIME file and the scheduled availability of the file, a new geofile is being developed by the county data processing center. This file is being developed independently of DIME from county data sources such as assessors' files, street department files, and voting files.

The University City Police Department had a system (PREWARNS) several years ago that, among other information, provided plots of the location of events. Although the system was not maintained after the grant-financed development period, the department still wishes to have this plot information. Such plots would require a geofile for obtaining coordinates.

There are also non-law enforcement applications of the DIME file. The regional transportation agency has already used DIME. The Data Processing Department of the city of St. Louis is encouraging use of the DIME as an alternative to the less general-purpose Wurdack file for agencies such as the street and fire departments.

The lack of use of DIME can be attributed to several factors. The DIME file has only recently become available after the CUE process. Even now it is not complete, because a copy of the file is at the Bureau of the Census for digitizing the x-y coordinates and was not expected back until the summer of 1979. Because of the growth in suburban counties, the file will be out of date when it comes back, and the CUE process will have to be continued.

DIME use is also inhibited by the lack of coordination between potential DIME users in the St. Louis area. Users do not coordinate DIME problems, status, and applications, nor do they organize the resources necessary to maintain the file in a state that will meet their local requirements. Three years ago SLMPD

had a grant to study the feasibility of standardizing the geographic base files of law enforcement in the St. Louis metropolitan area. Although SLMPD developed (on an LEAA grant) a consensus among law enforcement agencies in the five surrounding counties on DIME as a standardized GBF format, no agency committed resources to DIME development. Other than EWGCC, non-law enforcement agencies did not contribute to DIME development either.

5. DIME maintenance procedures. As the CUE agency, EWGCC will be responsible for maintaining the DIME file. Other government and private agencies that use the file will discover and correct errors on their copies of the file. EWGCC will encourage users who correct their own files to send the changes to EWGCC. No procedures to implement this maintenance cycle have been established yet. Unless there is coordination among users, the files will rapidly diverge. The end result will be a series of incompatible DIME files, and the regional sharing of information will be thwarted.

B. Tuscon

1. Agencies involved. The agency designated by the Bureau of the Census to maintain the DIME file for the Tucson SMSA is the Pima County Association of Governments. In fact, however, an unofficial consortium of potential GBF users work together at the technical and operational levels to support and develop DIME files and applications. The most active agencies in the consortium to date have been the Tucson Planning Department, Police Department, and Department of Computer Services (data processing). An individual from the Tucson Police Department is currently chairman of the consortium.

The Department of Computer Services has provided considerable technical effort for DIME file development and maintenance, as has the Tucson Police Department. The University of Arizona Computer Center has also provided some support.

Various other city and county agencies (e.g., the Public Library) also participate in the consortium, as do certain private concerns, such as the utility companies. All in all, approximately 25 public and private agencies are represented.

2. DIME development and correction. Recognizing that official joint participation would be difficult to establish among the various political agencies involved, the GBF consortium proceeded with the CUE process on a coordinated basis, with one agency providing office space, another providing clerical labor,

a third providing computer time, and so forth. The result, as of 1977, was a DIME file covering the greater Tucson area which the consortium felt was quite accurate.

3. Law enforcement use of IACP/Census technical assistance. The Tucson Police Department attempted to use IACP/Census project resources to aid in updating its GBF for use with a CAD system. The Department reported the following observations on that process:

- The INTERSECT program was useful.
- The POLYGON program was useful in concept, but its requirement for accurate node coordinates made it impractical to use.
- Other programs (REFORMAT series and related programs) were not of value because their processing options did not exactly meet local needs and/or their functions were so simple that they were easily performed by existing, available utilities or easily developed ad hoc programs.
- The primary value of the IACP technical assistance effort was in establishing contact between technical people in the Police Department and the Bureau of the Census.

At the time of the IACP/Census project work in Tucson, the real needs were for a cleaner DIME file and a method of converting the DIME to files useful for applications, notably CAD. The former requirement is fulfilled under the CUE program. The latter is largely beyond the scope of the Census software. Therefore, it appears that the effort expended under this project did not directly contribute to the Tucson Police Department's ultimate GBF use. However, there was certainly significant benefit in terms of increased understanding of the DIME file and useful contact with the Bureau of the Census.

4. Law enforcement and other DIME applications. As mentioned above, the primary application for a GBF at the Tucson Police Department was the CAD system. Additional applications were also developed in the area of statistical analysis of incident reports, including the development of coordinates for display of data on maps.

It is also worth mentioning that the Department operates a traffic accident analysis system which produces maplike graphic reports but does not actually use a GBF. Tucson's generally flat, rectangular street pattern with a very regular numbering scheme allows this approach to be quite useful.

Outside of the Police Department there is considerable interest in GBF applications, as evidenced by the active GBF consortium. The City Planning Department is probably the most active user, but the DIME file also is used for analysis of public library usage, survey data for the County Attorney's office, and utilities planning. Private commercial use of the GBF is welcome, as evidenced by savings and loan companies use in determining branch office locations.

5. GBF maintenance. GBF maintenance in Tucson is accomplished by the City Planning Department, which updates the maps (Metropolitan Map Series), and by the City Department of Computer Services, which updates the master file. One coder is employed half-time at Computer Services for this function. During the entire CUE process, Tucson has depended upon considerable analytical ability, judgment, and responsibility of the clerical personnel who did the coding. Tucson planners believe that this approach has been successful, although it has the disadvantage that these personnel tend to be promoted out of their positions with some frequency.

City Computer Services also devotes the occasional services of a systems analyst and a programmer to produce reports, summaries, and the like, using the GBF upon request from various agencies.

CHAPTER III. OBSERVATIONS AND FINDINGS

Data collected at the IACP, Bureau of the Census, Tuscon, St. Louis, and other data sources are organized in this chapter as follows:

- o Suitability of DIME as the basis of a law enforcement geographic base file.
- o Management planning.
- o DIME file correction and maintenance.
- o GBF software support as developed by IACP/Census and distributed during the earlier LEAA-sponsored project.
- o DIME applications and development, that is, the uses of the DIME file as a tool in applications that actually perform law enforcement functions.

Each of these categories includes several observations together with related findings and conclusions which were drawn by the present project team.

A. Suitability of DIME

1. Contribution of GBF as a law enforcement tool.

a. Observation. In both Tucson and St. Louis, applications relying on geographic coding are contributing to law enforcement operations and planning. However, automated geocoding via DIME files is limited to Tucson. Tucson is using DIME for some statistical reporting and evaluation and as input to a developing CAD system. For plotting applications, however, Tucson is able to convert addresses to approximate x-y coordinates without DIME due to the regularity of the street grid network. St. Louis uses a manually encoded geographic system developed by the SLMPD prior to DIME's existence. Because of the manual coding error rates and lack of flexibility, SLMPD is looking to DIME for further geographic developments.

b. Finding. The specific use of geographic files like DIME is in the conversion of address or intersection to either an x-y coordinate or to equivalent geocodes. These outputs, however, are not ends in themselves but must be used in applications (such as CAD or statistical reporting) that meet law enforcement objectives. It is the end products of the applications (address verification or a statistical summary of activity organized by geographic area) that are beneficial.

Computerized geographic coding is a tool that can cause the end application to perform more accurately, quickly, or inexpensively. Administrators and managers must first justify an application as beneficial and then also justify the costs of computer geocoding as opposed to manual geocoding. Administrators and managers do not always see the link between the DIME tool and the final information output and do not always understand the complexity and cost of GBF/DIME applications development. However, computer geocoding, once established, has many potential applications within law enforcement, such as CAD, statistical reporting, investigative support, crime trend analysis, traffic analysis, and event plotting. The cost of creating and maintaining computer geocoding must be balanced against this large number of potential uses.

2. Technical suitability.

a. Observation. Much effort has been expended on a national scale developing procedures for creating and manipulating DIME files. The process for maintaining, checking, and editing DIME files (CUE) is well documented, and many agencies (including law enforcement agencies) have DIME expertise and experience.

The DIME sequential blockface structure by itself meets some law enforcement requirements, such as geocoding event records for some statistical aggregation. However, most law enforcement requirements dictate that the DIME be modified. At the minimum, new geocodes (e.g., reporting areas, police beats) must be added. For many purposes it is necessary to generate other data structures to enable access by intersection, on-line inquiry, and the like. Relatively simple applications, such as traffic analysis, will generally require less restructuring than more complex applications, such as computer-aided dispatch.

Although most law enforcement applications require additions to and restructuring of the DIME, the DIME does lend itself to this process, and techniques for accomplishing the restructuring have been developed at a number of agencies.

During our project work, some user technical personnel expressed the opinion that a GBF for law enforcement should be resolvable to the premise address level as opposed to the blockface level of DIME. We believe that this opinion is not widely shared and note that the development and maintenance costs implied by such a resolution would necessarily be very high for most agencies.

A major deficiency in the DIME file is the lack of accurate and complete x-y coordinate data for each record. Yet coordinates are a necessary input to one of the more valuable law

enforcement applications--plotting. Plotting the location of event data on map overlays is a valuable tool for spatial analysis of event data such as in crime trend and investigative analysis. Other applications that require coordinates include resource allocation (e.g., for computing street miles within beats) and automatic vehicle monitoring (for showing map location of police units).

Finally, we note that from time to time the Bureau of the Census plans to change the format and certain geocodes (notably census tracts) in the DIME file as it meets Census requirements. Such changes may occur with little notice or consultation with DIME users outside the Census. Furthermore, these changes should not severely impact existing law enforcement users because the successful approach so far has been to maintain a local copy of DIME without any dependence on the Census. Such divergence, however, may eliminate the possibility of Census support for any file structure except its own latest version. User agencies may not be able to send their local files to the Census for digitization of x-y coordinates or use the Census file editing and correction software.

However, Census depends on local agencies for update information on the DIME files. If local agencies choose not to implement Census DIME changes for reasons such as the economics of reprogramming or retraining, Census could lose this update information. Because Census probably cannot assume responsibility for very many of the approximately 300 DIME files, it is likely to take a conservative view of DIME structure and code changes.

b. Finding. The existing DIME file structure and process are workable and should be built upon in future GBF work. Given the experience and documentation availible, it would not be cost effective to start an entirely new technical approach at this juncture. Changing the record structure to permit space for local user codes would be difficult at this point considering that another federal agency (Bureau of the Census) would have to be convinced of the efficacy of the change.

DIME file coordinates are a problem, as local agencies do not have the resources or expertise to collect and enter x-y coordinates on a DIME file. Using the Census as the digitizing agency entails very long turnaround times and project scheduling problems. Local agencies need assistance for digitizing node coordinates and adding the coordinates to DIME files. Such support could be accomplished by activities described in the following paragraphs.

LEAA could work with Census to adjust the Census digitization priorities based on the needs of local law enforcement agencies for the data. This is probably not viable, for Census has its own priorities and requirements for scheduling digitizing.

LEAA involvement might also raise the expectations of local law enforcement agencies when LEAA may have little actual control. Exploratory discussions with Census on this matter would certainly be useful.

There are commercially available equipment and organizations that do digitizing. LEAA could inventory and evaluate digitizing hardware and procedures and then develop a planning package to aid local agencies in setting up their own digitizing project. In this case, LEAA would act as an information source for local agencies that would actually buy and/or lease equipment and implement a digitizing project.

LEAA could develop a digitizing package consisting of digitizing hardware and software for editing and inserting coordinates into DIME files. This package would then be lent to local agencies who would furnish the manpower and mainframe computer time to do the actual digitizing. Any system would require good documentation on planning, costing, procedures, and training so that local agencies could run a project with a minimum of support from LEAA. LEAA would need a methodology for selecting and prioritizing requests from local agencies for the digitizing package and would also have to monitor package use to be assured that schedules are maintained.

3. Alternatives to DIME.

a. Observation. For an agency building a GBF, many alternatives to the DIME typically exist. For example, in the St. Louis area, GBF alternatives include: a telephone company billing file (for 911); a digitized street map file (for automatic vehicle monitoring); a locally developed city GBF (the Wurdack file); and a countywide geographic file (the COGIS file). In other areas, agencies have used assessors' files, utility department files, and so forth as a basis for a GBF. Of course, accuracy and completeness of these files vary from area to area, and their applicability to law enforcement problems depends on their detailed structure and the particlar applications being developed.

b. Finding. DIME files do exist for almost 300 SMSAs, leaving relatively few agencies in the United States that need a GBF, can afford a GBF, and yet have no DIME file as a basis. For those few the CUE process for developing a DIME appears to be better than starting from scratch.

Where a DIME file is present, there may still be good reasons to use some other GBF structure. The determination to use an alternative structure will likely be made based on local considerations of perceived storage and access costs as well as development and maintenance costs for the GBF.

Although a law enforcement agency might reasonably choose to utilize a non-DIME structure as the basis of a GBF, there is no productive way for LEAA to become directly involved in such development. Any techniques, data structures, software, and procedures developed in such a project would usually not have general applicibility to other sites.

B. Management Planning

1. Promise of LEAA grant money.

a. Observation. Personnel in both St. Louis and Tucson felt that there had been an implied promise by LEAA to furnish grant money or substantial technical assistance to work on the DIME file and law enforcement applications. Both cities were disappointed not to have received any such support. In the case of St. Louis, police DIME work virtually stopped. In Tucson, police geocoding applications continued to be developed due to the cooperative DIME work carried on by the geographic file consortium that had been in existence prior to the LEAA grant selection.

b. Finding. LEAA should have been more explicit about the grant funding in the past GBF project. When the original intent changed the new status should have been clearly explained to the participants so that they could adjust their plans and participation accordingly.

2. Lack of planning information.

a. Observation. Local agencies did not have the information required for planning a DIME project. Before embarking on the DIME projects, local agencies did not have perspective on the total time and effort that would be involved. There was a lack of technical experience in: (1) bringing the DIME file to the level of accuracy and completeness required, (2) designing the applications for using the DIME file, and (3) managing DIME file projects. When the LEAA grant money was not made available, the SLMPD did not have the planning information to make a proposal to the local criminal justice planning agency for a grant. As a consequence, DIME progress in the SLMPD halted. However, Tucson overcame the lack of grant money through close cooperation and resource sharing by the local agencies.

b. Finding. The requisite DIME experience is generally obtained through actually handling the files. The next best source is in-depth interaction with personnel who have actually been involved in the day-to-day manipulation of DIME files. A third source is technical literature and meetings that provide complete and accurate information to the DIME practitioner.

There is currently no central source of law enforcement DIME planning information. The IACP project seemed to be a good start in gathering and disseminating technical information, but planning information to be provided to requesting agencies and methodologies to aid in obtaining it are still lacking. Users now interact in a haphazard fashion and attempt to relate what information they get to their own particular situations.

3. Availability of information.

a. Observation. Several persons at user sites asked about what information was available on assistance, applications, software, and so forth. The questions indicated that the GBF documentation produced by IACP had not had wide distribution or had not been read. Users also indicated that descriptive literature only provided reports of applications successes when descriptions of design and implementation problems would also be useful. Technical users also expressed a desire for more technical descriptions of applications, both in the literature and at conferences and workshops. A broad overview may help managers and executives but is not sufficient for practicing designers and implementors.

b. Finding. The DIME user community needs better technical communications. To be most effective the communications should be directed at technical decision makers. A contact list should be accumulated of those involved in designing, implementing, and managing law enforcement GBF applications. Such persons can be found in law enforcement agencies, in city or county data processing centers, or in state and regional criminal justice information system centers.

A communications network must disseminate several levels of information. Users new to DIME need an overview of applications that DIME can support, as well as information for planning a DIME project. Users involved with DIME need to know of transferable software for adding geocodes and implementing DIME applications. Users also require TA to answer questions not covered in the documentation.

4. Requirements of multiple DIME users.

a. Observation. Law enforcement agencies are not the only users of DIME files in metropolitan areas. In fact, other agencies (planning, housing, utilities, etc.) are often making greater use of the DIME file than law enforcement agencies. However, law enforcement and other public safety agencies (e.g., fire and emergency medical) generally have had the most stringent requirements for file accuracy and completeness among all users.

b. Finding. Each agency using DIME has different requirements for file accuracy and completeness. Because law enforcement has the most stringent requirements, law enforcement agencies embarking on a DIME project should be prepared to spend additional resources for file preparation over and above what the CUE agency would spend.

Should LEAA develop a planning package for use by DIME file projects, local law enforcement agencies might find it easier to enlist the support of other agencies in joining a DIME project. Such support could include both manpower and money. Such a planning package might thus place law enforcement in a favorable position to influence the direction and course of the ensuing project.

Because DIME is useful for other agencies, other federal programs and federal sponsors might also support the development and use of DIME. This could reduce significantly the amount of funds LEAA might have to contribute to a DIME project. However, the time and effort required to surmount organizational, functional, political, and budgetary obstacles might well be prohibitive.

5. GBFs and applications implementation.

a. Observation. Development of a GBF is a long and difficult process. The resources and time required are often underestimated by local agencies. GBF projects tend to be successfully completed when there is a payoff, that is, a required application waiting to be implemented. This was not the case at the SLMPD where the DIME project was permitted to falter because no pressing need was apparent.

b. Finding. Because a GBF is a tool and not a functional end in itself, a GBF development project tends to be driven by the beneficiaries. The success of a project is dependent on the presence of required applications visible to users in the agency and timed to coincide with GBF development. When the GBF and the end-user application are joined, the results of GBF development are verifiable.

C. DIME File Correction and Maintenance

1. CUE: ease of use.

a. Observation. The CUE process developed by the Bureau of the Census has been successfully used by agencies throughout the country. The procedures are standardized and well documented. The skill of coding personnel who use the procedures

can range from unskilled high school students hired on a temporary basis (Tacoma) through permanently employed clerks selected for their abilities (Tucson) to professional geographers and similiarly educated individuals (St. Louis). All of these approaches as well as combinations of skill levels have been successful.

Local agencies seem able to run their own versions of the CUE software in both Tucson and St. Louis. St. Louis used the computer center at UMSL while Tucson used the city data processing department. In Tucson, the process was stabilized to the point where a clerk made up the data, ran the computer jobs, and checked the output with only infrequent support from data processing professionals.

b. Finding. CUE is a very successful program for building and maintaining a DIME file. Agencies using more skilled personnel felt that this was cost effective in terms of reduced training, supervision, and file errors. We believe that the use of skills above those of a good clerk were not warranted. The CUE software, once running on a local agency mainframe, seems to be dependable and easy to use.

2. Accuracy.

a. Observation. The CUE software includes various edit procedures such as street continuity and topographic (block closure) edits. The Bureau of the Census sets the target rate of record errors for DIME files at 5 percent. This means a 5 percent record error rate when comparing the DIME file to the Metropolitan Map Series maps. In practice, error rates considerably higher than 5 percent are encountered when comparing the file to the actual city geography traveled by local law enforcement agencies. There are several classes of file errors which CUE cannot detect (and which could not be detected by a purely automatic process). The result is that files accepted as sufficiently accurate for Census probably have 15 to 20 percent of their records in error. Even those files that are "perfect" with respect to CUE may well contain 5 to 10 percent record errors.

b. Finding. Some law enforcement applications can tolerate fairly high GBF error rates. Statistical studies will generally be adequate for planning purposes even if the error rate (i.e., unmatched addresses or intersections) is high. In contrast, CAD requires a very accurate file with an error rate of below 1 percent if user confidence is to be maintained. This means that, for many applications, the CUE edit process must be supplemented by continual manual detection of file errors to maintain the required accuracy.

D. GBF Software Support

The reader is assumed to be generally familiar with the functions of the existing REFORMAT software. Please refer to Appendix A for a general description of these programs.

1. Utility of REFORMAT series programs.

a. Observation. Law enforcement users in both St. Louis and Tucson agreed that the REFORMAT software developed by the Bureau of the Census was of marginal use for manipulating DIME files. The STRIP programs selectively remove data fields from DIME or intersection files. Although the function performed is useful, these programs are not as useful as other software utilities on the users' systems. The site utilities were more familiar to the users and permitted more general manipulation of data elements than the STRIP programs.

The INDEX programs reduce file sizes by replacing large data fields with pointers to index files. While this is functionally desirable, it was not used at the sites because either the applications did not require such compression or the compression occurred when the files were interfaced to the applications. Similiar comments could be made about the HEADER RECORD program.

b. Finding. The software designed and implemented during the IACP/GBF project was not useful to law enforcement EDP personnel because it generally accomplished tasks that could be more easily accomplished by using locally available software with which the users were more familiar. The concept of utility software for DIME manipulation is a good one. A set of generalized utility programs is needed by local agencies to perform the following functions:

- Delete a data field and blank out existing data.
- Add a new data field and initialize the field with blanks or other fill characters.
- Write data into a field from an external source file.
- Compress records where fields have been deleted.
- Rearrange the position of data fields within a record.

These requirements can be met by the use of standard utility programs and/or simple ad hoc programs written for specific purposes by local or TA staff.

2. Utility of CUE, INTERSECT, and POLYGON.

a. Observation. Other Census software--specifically the CUE software and the INTERSECT programs for generating intersection files from DIME files--seems to be meeting user needs. Tucson runs the CUE software to maintain its DIME and has the maintenance cycle stablized to a point where a clerk handles job set up, submission, and checking. St. Louis, however, sends its computer runs to the Bureau of the Census for processing with the attendant long and variable turnaround.

The POLYGON program which adds geocodes to the DIME file was not used by the agencies due to several factors. The input file is required to have complete, accurate coordinates in order to be geocoded. Users said that of all the data elements, the coordinates are the least accurate and complete. Therefore, there are many rejects and errors in the process of using POLYGON. The other complaint given was that when POLYGON did run it used excessive computer resources given the function it was performing. At both sites visited, the CUE agency had developed alternative and more satisfactory methods of performing the POLYGON function of geocoding a file.

b. Finding. An evaluation of the functions and performance of the Census DIME software could, if read by users or potential users, save each individual agency from re-discovering the same facts. In those cases where the programs implementing useful functions (such as POLYGON) are of limited value, alternatives are availible. An inventory of alternatives could save agencies development and programming time. Where a function is implemented and documented particularly well, a transferable software package could be developed.

E. DIME Applications and Development

1. Adequacy of technical assistance furnished.

a. Observation. Although the TA furnished during the IACP project seemed to be generally responsive, in many cases IACP simply acted as a switch to route requests to Census where the questions on the software could be resolved. This presented an extra delay to the users who eventually established direct links with Census. There were additional problems getting TA when there was a question about the DIME data itself rather than the computer programs. These problems required TA from someone directly experienced with converting a street network into a DIME file, and such support was not provided.

b. Finding. Past methods of providing TA need to be improved. Providers of TA must be directly experienced in the detailed technical tasks at hand.

2. DIME access interface for applications.

a. Observation. In addition to the utility software discussed in Section III.D.1, users expressed a need for a standard interface linking DIME files to applications. Typically, what was suggested was a callable subroutine that would, given an address as an input parameter, search a DIME file and either provide geocodes if the address existed or provide an error message otherwise. Such an interface would relieve applications designers of resolving issues of file organization and structure.

b. Finding. The design of the user's ultimate GBF is influenced by the types of data required, the types of access required, volumes of data, storage capacities, and other factors. In complex systems environments now facing many agencies, this design task is truly formidable. Local systems design and programming talent, although satisfactory for many purposes, is frequently not sophisticated enough for this task.

Implementation of a GBF access system is also a complex and time-consuming effort. Furthermore, this is an area in which a local agency generally does not have experience at the time a GBF project is undertaken. Given the number of different computer systems used by law enforcement agencies, design of a standard software access system that is efficient, transferable, and applicable in all system environments would be impossible.

As an alternative to the software approach, however, a hardware access system might be feasible. Such a system would consist of a microcomputer controlling a hard disk that contained only a specialized GBF. This system would be interfaced as a back-end peripheral device on the user's general-purpose or special-purpose host computer.

A standard access format from the host application would pass premise address, intersection, common place name, and so forth to the GBF microcomputer. The microcomputer would reply in standard format with geocodes, cross streets, equivalent addresses, and the like. Other standard replies would provide for name ambiguity, no record, and other error messages.

Support software (probably written in COBOL) would be needed on the host computer to convert an updated law enforcement derivative DIME file to the microcomputer's random access format and to load the file into the microcomputer for writing on the disk. This could be accomplished any time file maintenance was necessary or in order to restore a damaged file.

The concept of a GBF data base machine addresses many of the difficult issues of GBF access. Users with limited technical

sophistication could develop applications knowing that the GBF design had been proven and implemented. Users procuring turnkey systems (such as CAD) could specify an interface to the GBF data base machine.

CHAPTER IV. RECOMMENDATIONS FOR CONTINUED LAW ENFORCEMENT SUPPORT

This chapter sets forth the recommendations we believe LEAA should implement for continued GBF development for law enforcement. The recommendations are organized into sections that parallel the discussion in Chapter III. Chapter V draws the recommendations together into specific action programs.

A. Suitability of DIME

1. Basic support of DIME. LEAA should continue to support the DIME file as the basis for geocoding applications in law enforcement agencies. A new technical approach is not warranted given the software and expertise available to process DIME files. LEAA should require strong justification, possibly confirmed by independent investigation, before supporting an agency's GBF development using non-DIME formats and procedures.

2. Supporting non-SMSA areas. Agencies which are not in Census designated SMSAs will not have DIME files developed by the Bureau of the Census. LEAA should support such agencies when they seek to develop a GBF capability based on creating their own DIME file. These agencies should be strongly encouraged to use the DIME format because techniques and tools for applications and maintenance exist for the DIME.

B. Management Planning

1. Project planning information. LEAA should develop a project planning and project management package for local law enforcement agencies desiring to start a geocoding project with DIME files. Such a package would include information on the process of selecting applications that meet local objectives and organizing a project to create and maintain a DIME file. Ideally the package would provide a step-by-step guide on organizing, funding, and controlling such a project. Because of the multiuser nature of DIME files, coordinating with other agencies would be covered. The package should include a methodology and worksheets for cost-benefit analysis and reporting. Particular emphasis should be placed on developing cost and schedule information which is not currently available.

2. Local support methodology. LEAA should develop explicit guidelines for the types of local support it wishes to furnish to local law enforcement agencies and the conditions to be met by local agencies before such support can be furnished. Agencies should be provided with information so that they can know what kind and how much support they might receive as part of their planning process for GBF projects. The eligibility criteria should consider such factors as: population served by agency; number of agencies cooperating; applications being developed; transferability of applications; and an LEAA approved project plan.

Maximum resource limits should be set to encourage participation by local agencies in projects that will be supported and used over the long term by the developing agencies. Support for GBF development should be tied to the development of significant GBF applications within the agency. The type of support may vary but includes providing: planning or application design information; planning grants; development grants; transfer grants; telephone TA; and on-site TA.

3. Applications selection. LEAA should develop an applications selection package for law enforcement agencies. This package would include an inventory of applications software available from various agencies, information on type of DIME interface necessary, and documentation on transferability considerations. As a basis, this package should use the existing IACP information, but that information should be updated and extended.

4. Planning and applications technical assistance. LEAA should provide limited short-term TA to support the management planning and applications selection packages described above. This TA should be limited to supporting an agency in the early stages of developing a plan for a GBF project or selecting an applications package suitable to the technical and operating environment of the agency.

5. Coordination with other federal agencies. LEAA should remain aware of the potential for coordinating efforts and sharing costs for GBF/DIME support with other federal government departments such as the Departments of Transportation and of Housing and Urban Development. LEAA should designate an individual to establish informal contacts with these agencies so as to remain apprised of significant opportunities for cooperation. This individual should also coordinate GBF-related work within LEAA. LEAA should maintain more cognizance of the relationships to geographic base files in projects related to 911 systems, automatic vehicle monitoring, crime analysis, resource allocation, CAD, and so forth.

C. DIME File Correction and Maintenance

1. Use of CUE process. The CUE process as promulgated by the Bureau of the Census seems to meet the current needs of law enforcement users. No new developments are required in this area. Law enforcement users who inquire about this process should be directed to the appropriate CUE documentation.

2. CUE technical assistance. Because Census only provides documentation to agencies not designated as the CUE agency for a region, LEAA should consider providing qualified TA to law enforcement agencies for setting up CUE procedures and for troubleshooting.

3. Support for digitizing coordinates. LEAA should study the detailed feasibility of creating a transportable digitizing package consisting of a digitizer, a microcomputer, and software to record, compute, edit, and insert x-y coordinates into DIME files. The package should also contain documentation on system operating procedures and required interfaces to a mainframe computer.

D. GBF Software Support

1. Drop REFORMAT series. LEAA should not provide any further development effort for the REFORMAT series of programs as they currently exist (STRIP programs, INDEX programs, and HEADER-RECORD). These programs have not been shown to be flexible or general enough to provide users with adequate service. Local agencies have thus far obtained these functions from their existing computer software.

2. Development of software tools. A generalized geocoding computer program should be developed to replace POLYGON. The function of this new program would be to assign geocodes to DIME records that are identified by a fully qualified block number or another geocode. The new program should be table driven rather than geometric, as is now the case. A related computer program should be developed to insert coordinates in DIME records. An input to this program would be a table of nodes and their equivalent coordinates. The program should also optionally convert coordinates from the units on the input to Map Set Miles, State Plane, and Latitude/Longitude as appropriate.

E. DIME Applications and Development

1. Technical documentation. LEAA should assemble an annotated bibliography of the currently available information on DIME files and DIME applications. Included in this bibliography should be references to the materials developed by IACP and the Bureau of the Census and to any other DIME-related literature. The bibliography should be available as part of the project planning package.

LEAA should identify exemplary DIME projects and applications during user contacts and provide support for documenting the detailed design and implementation of these projects. Included in the documentation should be design philosophy and trade-offs, file formats, decision logic, error and ambiguity resolution, and human interface design. This documentation would then be distributed at workshops and in conjunction with TA and planning requests.

2. Two-way communications with users. LEAA should maintain a toll-free "hot-line" to provide prompt answers to technical, planning, and design questions. This hot-line should be handled as part of a TA program.

The workshops, user groups, and the advisory group developed by IACP were valuable communications tools. These should be continued in the future. The workshops, however, in contrast to past presentations, should be targeted at the technical EDP law enforcement users, and appropriate technical content should be covered. This means that workshop attendees should be screened so that only technical personnel attend. User group meetings should be designed for administrative and executive staff of law enforcement agencies.

3. GBF access method software. There appears to be no good approach to developing software to access a GBF that can be generally applicable across a number of computers, transferable, and reasonably efficient. Therefore, it is recommended that LEAA not develop such access method software. The design documentation described in previous recommendations should permit users to select and implement access methods which best meet their individual requirements.

4. Application TA. LEAA should provide TA by individuals qualified in implementing GBF applications. The qualifications required include expertise in GBF/DIME data base implementation, access method design, and specific experience in GBF applications development and use. This calls for a highly technical data

processing person rather than a planner or an administrator.

5. GBF data base microcomputer package. Although a purely software approach to GBF access is not appropriate for national-level support, a combined hardware-software solution might solve the transferability and efficiency problems. LEAA should therefore perform a feasibility study for developing a GBF data base microcomputer system as described in Section III.E.2. Technology and cost estimates should be made for developing the hardware, software, and operating procedures. The following components should be identified during the study:

- Microcomputer with appropriate speed, reliability capacity, and interface capability.
- Disk drives that are readily available and reliable.
- Microcomputer software that is efficient yet easy to maintain.
- Support software in COBOL on a host machine to manipulate and load a law enforcement derivative DIME file into the microcomputer.
- Interface specifications for an applications program on the host computer to communicate with the GBF back-end machine, including line protocol and message formats and contents.

CHAPTER V. GBF ACTION PROGRAMS FOR LEAA

This chapter reorganizes the recommendations presented in Chapter IV into an action program that will enable LEAA to focus its resources for maximum user service. This action program can be used as a guideline for selecting services LEAA deems to be within its budget and time constraints.

A. Continuity of a GBF Program

One of the most important issues LEAA must address is the continuity and duration of support it wishes to provide for GBF development and use. The process of developing a GBF and GBF applications typically requires 1 to 4 years in a law enforcement agency. LEAA services should be available to a local agency during project startup and for the duration of the development and implementation period.

Therefore, LEAA should not enter into a GBF assistance program unless it reasonably expects to support the program continuously for at least 4 to 5 years. If the LEAA program is not continued beyond the development of the GBF products or there are lapses in the LEAA program, users desiring support may not be able to contact the appropriate support providers, or users involved in GBF projects may lose project momentum and morale. Consequently, user perception of the services would be poor, negating the effects of developing exemplary GBF products. "Continuous support" is the key concept. Investments in information, planning, and systems may not be cost effective if the dissemination and support components are not always available due to project lapses.

B. The Role of LEAA in GBF Assistance

Equally important to concerns of continuity and duration, is the necessity to define what role LEAA will assume in supporting GBF activity. As an aid to LEAA decision-making, this report presents the following three role options:

- Information Broker--Provide planning and technical information and assist users in exchanging information among themselves.
- Technical Assistance Coordinator--Maintain a TA program supplying qualified assistance in GBF planning, development, and implementation as well as applications selection and implementation.

- GBF Tool Developer--Develop and disseminate software and hardware tools for working with DIME and GBF applications.

In general, these three roles are successively cumulative; that is, the TA role would also include the information broker role, and the tool developer role would include the other two.

The specific recommendations associated with each of these roles are discussed below.

C. Program 1: Information Broker

By developing planning guides, applications inventories, technical documentation, and the like, LEAA can provide useful services to local law enforcement agencies. LEAA would also keep up to date with local problems and developments in order to identify trends and areas where centralized support would be useful.

The recommendations included in this program are:

- Develop project planning information
- Develop an applications selection package
- Coordinate with other federal agencies
- Develop technical documentation
- Establish two-way communications with users.

D. Program 2: Technical Assistance Coordinator

Contact with knowledgeable individuals during system design or transfer can often save time and provide better, more reliable systems. LEAA can provide the linkage between local law enforcement users and technically qualified TA providers. From its national perspective, LEAA can identify technically qualified TA providers who have both the expertise in exemplary GBF projects and the communications skills to transfer or utilize that expertise. LEAA can arrange to manage TA requests so as to provide appropriate and qualified individuals, yet not overload any specific provider.

LEAA must also address the funding of such a TA effort. How many days per site will LEAA fund before the local agency is asked to contribute? It is clear that local agencies should fund the design and development of GBF projects, yet providing small amounts of money for project initiation is an appropriate action for an agency such as LEAA with a national capability development charter.

The following recommendations would be included in this program:

- o Develop a local support methodology
- o Provide planning and applications selection TA
- o Provide CUE TA
- o Provide applications TA.

Given the varied nature of TA and the expected demand, it would be most effective to establish a permanent core TA team of at least two people, and a broader support team that can be called upon when needed. This team would be responsible for developing and disseminating the information specified in Program 1 as well as providing TA. TA would also be provided for any of the tools developed in Program 3. For very specialized problems or applications, the permanent core team would be augmented by a network of qualified part-time people. The individuals in this network would be prescreened for competence in various key subject matters as well as for communications skills. A toll-free telephone number to increase access to the TA group could be a cost-effective addition.

E. Program 3: GBF Tools

Local agencies (especially the small- and medium-sized agencies) do not have the resources to develop sophisticated tools for one-time projects such as DIME development. Provided proper information, however, they can transfer and implement sophisticated tools and applications. From its central vantage point, LEAA can develop the GBF tools that would best support a majority of local law enforcement agencies.

The specific GBF tools recommended for feasibility study are:

- o Coordinate digitizer
- o GBF data base microcomputer system.

F. Program for Immediate Action

To implement any of the above programs, LEAA would need to develop a project plan, assign program staff, and commit substantial resources. While we believe a major effort in the GBF area is appropriate for LEAA, we also recognize that such a program requires considerable time to get under way.

To respond rapidly to perceived user needs, we have formulated a limited initial program of action items that we have chosen according to the following criteria:

- Action items must contribute to LEAA's longer-term support of GBF programs.
- Action items must, in themselves, contribute direct benefits to user agencies and/or lay the necessary foundations for significant longer-range LEAA GBF programs.
- The time to complete any one action item must be approximately 6 to 9 months.

Within these guidelines, the following items are presented as candidates for immediate action by LEAA:

- Action Item 1: Project Planning Package. As per recommendation IV.B.1, develop a DIME/GBF project planning package for law enforcement agencies. The package would include guidelines for creating a DIME file, selecting applications, and managing and controlling a project. It would assist a local agency to estimate project duration, cost, and benefits.
- Action Item 2: Applications Selection Package. As per recommendation IV.B.3, develop a package for aiding users in the selection of specific applications requiring geocoding. The package would inventory available applications and discuss transferability considerations.
- Action Item 3: Digitizing Package. As per recommendation IV.C.3, conduct a feasibility study of a transportable hardware/software digitizing package. If warranted by the feasibility study, develop specifications oriented toward a competitive procurement. Thus, LEAA would be in a position to implement the digitizing package rapidly whenever the decision to develop one is made.
- Action Item 4: GBF Data Base Microcomputer System. As per recommendation IV.E.5, conduct a feasibility study, including an analysis of potential user acceptance, of a GBF data base microcomputer system. If warranted by the feasibility study, develop preprocurement specifications as in Action Item 3.
- Action Item 5: Technical Assistance. As per recommendations IV.B.4, IV.C.2, and IV.E.4, provide directed TA on GBF to agencies selected by LEAA. TA should be oriented not only to the perceived needs of the requesting agencies but also toward gathering information on GBF/DIME implementation projects and user community requirements.

This information would assist LEAA in maximizing the effectiveness of future GBF activities.

Concurrent with the implementation of these action items, preparations could be under way for the remaining recommendations and for the three programs described previously.

Appendix A
DESCRIPTION OF THE REFORMAT SOFTWARE

The REFORMAT software package includes the following eight major computer programs that operate on a DIME file to create derivative law enforcement GBFs.

POLYGON: a system which allows the user to add local geocodes to the file. The user identifies the boundary segments (using x-y coordinates or node points off the Metropolitan Map Series maps) for each geocode. The program uses this information to define the boundary and identify which segments inside the boundary should receive the geocode identifier.

INTERSECT: a system which creates an intersection file from the GBF/DIME file. It consists of seven computer programs. The intersections are determined for street and non-street physical features using the same Map-Tract-Node configurations as the match key.

STRIP DIME: a program which will allow the user to selectively remove data fields from the GBF/DIME file to create a reduced content geographic base file. It will also remove codes from a GBF/DIME file which has local geocodes attached (i.e., an output file from the POLYGON program). Substantial reductions in file content are possible with this program.

STRIP INTERSECT: a program which operates in a similar manner to STRIP DIME and produces intersection level elements.

INDEX DIME: a program which creates an index file system primarily for on-line applications. The user selects appropriate codes off the geographic base file, moves them to a subfile, and replaces the code with a pointer. Pointers may be created between the master file and the subfile or vice versa. This program may be used with the GBF/DIME file to integrate local user files that contain common place or street name abbreviations and misspellings.

INDEX INTERSECT: a program which operates in a similar manner to the INDEX DIME and generates an index for the local intersection file.

HEADER RECORD: a program which is used to reduce redundancy by creating a variable record length file with an initial header record containing information to be duplicated on succeeding records. Normally this program is used to reduce the redundancy of the street name file by listing the street name once and following this listing with succeeding records of the same name.

POLY-GUIDE: a program which creates a street span system by using either a GBF/DIME file or GBF/DIME with local geocodes attached. The system accepts parameter card input and will produce span records for the geographic district indicated by the user. A secondary district with overlapping boundaries may also be indicated to produce additional segmentation of the GBF.

Appendix B
PERSONS CONTACTED

BUREAU OF THE CENSUS
Suitland, Maryland
- Robert LaMacchia, Chief Program Development Branch, Geography Division
- Bruce Strahan, Assistant Project Director, Law Enforcement Geo-Processing Systems, Geography Division

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE
Gaithersburg, Maryland
- Samson Chang, Senior Staff Analyst

ST. LOUIS METROPOLITAN POLICE DEPARTMENT
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GLOSSARY

CAD	Computer-aided dispatch
CUE	Correction, Update, and Extension
DIME	Dual Independent Map Encoding
EWGCC	East-West Gateway Coordinating Council
GBF	Geographic base file
IACP	International Association of Chiefs of Police
LEAA	Law Enforcement Assistance Administration
PARIS	Police Automated Radio Record Information System
REJIS	Regional Justice Information System
SLMPD	St. Louis Metropolitan Police Department
SMSA	Standard Metropolitan Statistical Area
TA	Technical assistance
UMSL	University of Missouri - St. Louis

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