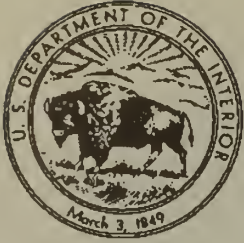




**A  
Study  
of  
Land  
Information**

**Prepared in accordance with Public Law 100-409  
(The Federal Land Exchange Facilitation Act of 1988)  
U. S. Department of the Interior  
November 1990**



## **Department of the Interior Mission Statement**

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protection of our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

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# A Study of Land Information

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# A Study of Land Information

## *Executive Summary*

**Introduction.** The Federal Land Exchange Facilitation Act of 1988, Public Law 100-409, was signed into law in August 1988 to facilitate and expedite land exchanges involving lands managed by the Departments of the Interior and Agriculture. Legislative testimony also recognized that in order to assure orderly land exchanges, all parties to the exchange must have accurate land data, including surveys and maps. Section 8 of the Act called for a study and report concerning possible improvements in the handling (collection, storage, use, and dissemination) of information related to Federal and other lands.

The Department of the Interior was given the responsibility to conduct the study mandated in Section 8. The Bureau of Land Management (BLM) was assigned the leadership role in the completion of this study. The United States Geological Survey (USGS) worked closely with the BLM in coordinating the required study efforts. In developing the strategy for this study, the Department of the Interior guidance emphasized that this study focus on the collection and maintenance of land data, on land information systems at various levels of government, and on improvements in surveying and mapping activities.

**Study Approach.** The study addresses all topics cited in Section 8 of Public Law 100-409, with a focus on land information systems (LIS) and associated activities. These topics include:

- Previous Studies
- Ongoing Activities
- Coordination and Roles/Responsibilities
- Guidelines/Standards
- Benefit/Cost Analysis
- Recommendations for Legislation/Policy Changes

**Team Composition and Consultation.** In an effort to involve all levels of interest specified in Section 8 of the Act, and to gain a broad perspective on the issues involved, a core study team was established. The BLM's Deputy Assistant Director for Support Services chaired the study team. Members included representatives of the

following agencies and groups: USGS; Department of Agriculture; Department of Commerce; National Science Foundation; National Governors' Association; National Association of Counties; and an Ad Hoc Committee organized by the American Congress on Surveying and Mapping and the American Society for Photogrammetry and Remote Sensing representing professional societies and organizations in both public and private surveying, mapping, and related fields.

**Background.** Land information is a vital national asset that supports many governmental and non-governmental activities. This vital asset exists but cannot always be used effectively because it may be of poor quality and it may not be organized or managed to take advantage of its full potential. It is collected, stored, used, and maintained by agencies at all levels of government--Federal, State, county, and municipal, and by regional commissions and public utilities, as well as by many private organizations. Land records typically are found at numerous agency offices in unrelated map and textual formats, such as property record books, paper files, microfiche, maps, charts, and computer data bases.

Even though critical information may exist for a particular parcel of land, it often is difficult to retrieve efficiently and often impossible to relate to relevant information in other land information files. The land data held by one agency frequently are "unavailable" to another agency, not because of jurisdiction, but because of the method used for record keeping or because of the data format.

This "unavailability" has several costly consequences. For example, it often results in one agency duplicating the same information that another agency already possesses because the data are not in a usable format, or because the agency is unaware of the data's existence. As a result, public and private officials often increase the cost of land-related decisions or make these decisions with inadequate or inaccurate information. In 1989, this issue surfaced in a popular Sunday newspaper supplement that reported on foreign investments in American lands, stating that it is almost impossible for the public or the

Congress to evaluate information on who is purchasing what, or to realize the magnitude of the purchases, because documentation is spread through many levels of government.

**Land Information Management.** Effective land information management is essential because many different agencies, organizations, and individuals need land information regularly for many different purposes. The essence of a land information system is providing the ability to link a multitude of land related attributes, often from many different sources and maintained by many different agencies, to a unique geographic location or area. To accomplish this, land information managers must rely on a framework that ensures compatibility among many different information systems. This framework should facilitate the sharing of information among decisionmakers and other users in both public and private organizations who require these data for day-to-day policy, management, and operational decisions.

For purposes of this report, the term "*land information system (LIS)*" is used, and refers to a geographic information system that is designed to collect, store, manipulate, and retrieve data primarily focused on land parcels and associated records within the legal jurisdiction and administrative boundaries of a governmental unit. An LIS has two main parts: locational (spatial) information and text (attribute) information. Spatial data must be linked through a common coordinate system that will provide a standard geographic locator. Attribute data must include some common identifier that will relate to the spatial data. The great advantage of an automated land information system comes from the ability to combine locational information and text information.

**Previous Studies.** Previous studies by the National Research Council and by State and private organizations have cited a substantial need for compatible land information systems to improve land conveyance procedures, to furnish a basis for equitable taxation, and to provide much-needed information for resource management, infrastructure management, and environmental planning. Some of the studies have suggested that significant benefits would be achieved if the Federal government better coordinated its land geographic information activities. The studies point out the need for a coordinated effort in land management at all levels of government.

More than half of the studies reached the following conclusions:

1. There is a critical need for better land information;
2. Land records are not uniform nor are they related to a high quality geodetic reference system;
3. Current modernization efforts are uncoordinated and do not meet their full potential;
4. Inter-governmental relations--Federal, State, local--require coordination and standards;
5. Technological advances in computers, mapping, and surveying provide a foundation for integrating land information;
6. Lack of Federal leadership is a serious impediment to effective application of the technology to the LIS problems;
7. Formal legislation is required to achieve a national LIS policy that will accomplish the goals of a multi-purpose LIS and ensure an appropriate funding authorization;
8. There should be a single organizational unit in Federal, State and local governments responsible for LIS that is able to set priorities, coordinate efforts, and act as liaison to other levels of government.

**Ongoing Activities.** The management of land information is developing into a significant industry in the United States. There are few activities, especially at the local government level, that do not require information by location in order to function properly. Ongoing LIS activities touch almost every governmental entity in the United States. In fact, these activities are stimulating major advances in new technology as private industry responds to the emerging needs. There is a need for leadership to provide guidance and coordination in the growth of land information systems. Since an overriding concern is to provide for the best possible management of the land to meet the needs of the present while sustaining the ability to meet future needs, a key part of the solution is to ensure the best possible management of the information about the land.

There are numerous ongoing activities that illustrate the breadth and depth of LIS. They show that the potential is limited not by technology, need, or inventiveness of government or private industry, but rather by the lack of institutionalized coordination of land information management. The use and the development of the new technology will proceed at an ever increasing pace, with or without overall leadership and coordination. With the

addition of leadership and coordination, mutual goals will be articulated and effort and money will be used more effectively.

**Coordination and Roles/Responsibilities.** The problem of coordination has been one of establishing a mechanism to deal with organizations at different levels of government, having different missions, that have not had a need to coordinate in the past. Without Federal leadership, there appears to be little chance of compatibility among the land information systems of the individual States. Likewise, individual county and municipal land information are likely to become compatible only where the Federal Government or other coordinating body issues standards and procedures. In the process, Federal and State agencies should assume larger shares of responsibility for the components of land information systems involving common data sources, standards, and multi-state integration.

The State role in land information activities is emerging as a key link in this country's highly decentralized intergovernmental system. The States create and define the legal and operating environment in which local governments operate, where the primary responsibility for land record maintenance rests. A key responsibility of the States should be to coordinate the collection and maintenance of data elements as well as the use of standard terms and procedures needed by State and local agencies.

Local governments manage the greatest amount of land information at the parcel level. Local governments provide the largest number of services to the public, such as those involving public utilities and public safety. They rely on land information for many needs, not the least of which is land zoning and property taxation. LISs are also being developed and managed by other entities such as regional associations of governments.

Thus, a local LIS necessarily reflects factors that consider the needs of other jurisdictions, including State and Federal governments, and the private sector. Such a system provides the means to transmit land information to and from the other levels of government.

The private sector plays a dual role as builder and user of land information systems. The private sector can make a valuable contribution to the development of an LIS data base, as well as in the maintenance of parcel maps and attribute data. Private firms have made

significant investments in equipment, personnel and training. As a result, their capabilities are extensive and varied, and the number of firms offering data collection and data management services is increasing. Another key role of the private sector is the development of new hardware and software to support LIS activities.

**A strong LIS education program should be supported by all levels of government, the private sector and through professional associations.** The development of college curricula that support the interdisciplinary needs of LIS is needed to provide an educated work force for an expanding LIS industry.

**Guidelines/Standards.** For the purpose of this report, a standard is defined as a specification, test method, definition, classification, or practice that has been approved by the sponsoring group and adopted in accordance with the procedures established within the appropriate laws, regulations, directives or technical society. Standards should provide compatibility across multiple levels of government and private interests. The standards should be specified carefully to support the varied interests, perspectives, and requirements of the individual organizations, each of which has different functional roles regarding land information. They should address the human definition and interpretation, the physical measurement, and the computer processing of land data. The standards should achieve acceptance across organizational and professional boundaries, many of which place real or perceived constraints on the process. To date, work on standards has been fragmented, and in some cases non-existent. For example, there are no standards for legal accuracy of deed descriptions that are filed, or even for a requirement that they be filed. Standards should be designed to allow and promote innovation and development, not to hinder such progress. For example, standards for interfacing between computer systems have promoted advances.

The standards developed should be integrated into a parcel-based LIS model that can be applied to publicly and privately-owned land. Several standards already exist and can be incorporated into a structure of LIS standards. Standards of accuracy for the geodetic reference system and specifications to support these standards have been enacted by the Federal Geodetic Control Committee. National Map Accuracy Standards have been in existence for more than 40 years. A proposed standard for digital spatial data transfer has

been developed through efforts of three groups: The National Committee for Digital Cartographic Data Standards, the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography and the Digital Cartographic Data Standards Task Force. Standards on parcel identification have been published by the International Association of Assessing Officers. The land information standards should build on these existing standards rather than replace them. Modifications and additions may be necessary to adapt them to specific LIS requirements, but many areas are already covered.

**Benefit/Cost Analysis.** Costs and benefits play a major role in program decisions. Benefit/cost analysis has been the major means of justifying new systems or improvements to existing ones. In land information management, however, neither the costs nor benefits are well understood. There is a need for research on costs and benefits relating to both the implementation and the maintenance of land information systems. Of concern is not only the issue identifying what the benefits are, but also who will receive them, and when. Potential benefits are often indirect and difficult to quantify. They may not be realized for years or even generations and are thus heavily discounted, except when institutional arrangements are affected.

The Office of Management and Budget estimated that obligations for Federal information technology reached \$17 billion in 1990 and accounted for 1.6 percent of the Federal budget. While these figures represent all areas of information technology, not just those for spatial data, they do represent a continuing commitment to prudent investment in modern technology in a period of constrained resources. A more formal commitment to land information coordination will assure a wide variety of data users at all levels of government and in the private sector that land information is produced more efficiently, is more easily accessible to all user groups, and is more readily understandable and suitable for diverse applications. A summary of the benefits from achieving a coordinated network of land information systems includes:

1. High-quality data and proper data organization will enable users to relate the data in an LIS to other information they require about the land.
2. A coordinated approach at all levels will improve the

quality, access, and utility of the LIS, and will link information and analytic resources to the policy needs of agencies.

3. A coordinated LIS approach will avoid duplication of effort and the proliferation of incompatible systems.
4. A coordinated approach will enhance the appraisal process by greatly increasing the capabilities available to the officials responsible for information storage, retrieval, inventory, and analysis, enabling that official to make more informed judgments and thus move towards more equitable taxation within the level of government affected.
5. Coordination of automated activities at the local and State levels will facilitate the updating of the LIS to ensure that the latest information is available to the various users.
6. Many of the local land information systems described in Chapter V (Ongoing Activities) predict specific tangible benefits in both dollars and staff efficiency.
7. Local land information systems enhance the enforcement of State laws requiring the monitoring of development and the availability of basic services such as roads, water, sewer, and parks.
8. Coordination will enhance efficient planning and management of the Nation's infrastructure.

The costs of implementing computer-based land information systems have focused attention on how costs associated with collecting, processing, and distributing digital information should be recovered. The main concern is with establishing a price for the information or product, but there are many related issues.

Traditionally, most public goods have been provided at a token price. Government reports, for example, have been marketed at a price well below their true cost of production. As cost recovery becomes more important within government and large investments are made in computerized information, pricing has become a concern.

Strategies for setting prices should cover production and handling costs, capital costs, user demand and willingness to pay, and competition with other producers. Federal and State involvement in the development of land and geographic data bases is continuing to grow. This involvement will help ensure the necessary coordination of all levels of government and the private sector.



# Recommendations

Based on a review of previous study recommendations and ongoing activities at all levels of government as well as the private sector, the Section 8(b) study team found that there is no overall organizational responsibility for the coordination of land information systems in this country. Therefore, there is a need for a focal point that would provide oversight for development of a comprehensive, consistent, nationwide network of compatible land information for use by the Federal, State, and local levels of government as well as the private sector.

While land information is gathered at the national or State level, the prevalent opinion at the county, municipal, or town levels is that State and Federal land information often is too general or inappropriate in scale and resolution to be useful for local decision-making. Therefore, there should be a national strategy for the aggregation of land information that is collected locally to meet local requirements.

Federal and State agencies should assume a larger share of responsibility for the components of land information systems involving common data sources, standards, and multi-State integration. Recommendations to fulfill and support the needs identified in this study are made in five general areas: (1) land information network concept; (2) coordination; (3) guidelines/standards; (4) funding; and (5) education.

## 1. Land Information Network Concept.

To provide a framework for establishing a common approach to land information management, there must be a unified LIS concept. Therefore, compatible land information systems should be developed at the local, State and Federal levels of government in cooperation with the private sector.

These systems should be structured on common components, use existing data sources when possible, and be linked through a common coordinate system. The data should be organized so they can be linked and accessible on the basis of parcel information as well as location information and can therefore be related to data in adjoining jurisdictions.

**1-A. The concept of a nationwide integrated land information management system should be adopted.**

## 1-B. The components that all land information systems should contain are:

- Geodetic control in the form of geographical or rectangular coordinates;
- Basic map information, including roads, hydrography, and cultural features;
- Property boundaries, including a unique identifier for land parcels;
- Land attributes, including legal rights, and land use information as needed by the particular jurisdiction.

## 2. Coordination

There are at least four areas in which coordination should be improved:

*First*, Federal agencies should continue to develop a coordinated land information management process.

*Second*, It is essential that State responsibility be defined and implemented to ensure land information coordination and management. This process should accommodate the needs, schedules, and data resolution requirements of State and local governments as well as the private sector.

*Third*, Federal and State agencies should pay closer attention to data being generated and used by county and local governments as well as the private sector. Many of these data are of higher resolution than needed at the State or national level but with modern LIS technology, these data can be generalized to provide a more efficient information source than can be obtained from separate original collection processes.

*Fourth*, coordination mechanisms should be put in place to continually revise and update land information. Land information is seldom static, and its value deteriorates with age.

The Section 8(b) study team considered several alternatives that would provide coordination for LIS activities at all levels of government including a national LIS commission and a single Federal agency with responsibilities for surveying, mapping and land information. The study team believes that active coordination of surveying, mapping, and land information functions is the most practical approach to ensure an effective nationwide program. This coordination can be achieved under existing authorities.

Therefore, the Department of the Interior will take action to ensure that coordination activities continue.

**2-A. Circular A-16, Coordination of Surveying and Mapping Activities, which was last revised in 1967, is currently being reviewed, and will be updated to reflect support for Federal coordination and leadership as well as an outreach program to State and local governments and the private sector.**

**2-B. Responsibility for the coordination of LIS activities should be assigned to an individual organization at State and local levels of government.**

**2-C. A process should be established for providing technical assistance to State and local governments.**

### **3. Guidelines/Standards.**

The development and implementation of guidelines and standards will help ensure that the land information systems of different levels of government, or of different agencies of one level of government, are indeed compatible.

**3-A. Current activities should continue regarding standards that relate to all aspects of an LIS. Particular emphasis should be placed on:**

- adoption of and adherence to already established standards;
- development and implementation of data exchange standards;
- identification of areas that need new standards.

**3-B. A commonly understood data model should be developed that would establish logical relationships among land entities (parcels, subdivisions, etc.).**

**3-C. LIS guidelines should be established that include data quality and accuracy.**

**3-D. Standard definitions should be developed for the data components of an LIS that specify content, quality, and accuracy so that the compatibility of data can be judged for data sharing, and so that decisionmakers have an objective basis for deciding what level of data is most appropriate for the purposes of an LIS within their budgetary constraints.**

### **4. Funding.**

**4-A. A funding strategy should address: (1) existing sources of funding and current expenditures in government and in the private sector; (2) funding of the LIS coordination organizations; and (3) the importance of sharing data between government agencies and the private sector, such as utilities.**

### **5. Education**

Land information systems are complex, interacting with all aspects of society. They will have a wide range of potential impacts, many of which may not presently be identified. Applied research on managerial, institutional, economic, legal, and technical issues will be required. There is also a vital need for managers and users of land information to be knowledgeable if the information is to be used effectively in decisionmaking.

**5-A. In order to improve the overall knowledge and capabilities of LIS personnel, a procedure should be developed for personnel exchanges across all levels of government, the private sector, and geographic regions. Models should be developed for an ongoing training program for State, local, and private sector practitioners.**

**5-B. A mechanism should be established for continuing curriculum development to foster long-term orientations to land information management. Doing so would provide for a wide variety of media for training delivery to reach the vast number of individuals working in land information related professions.**

## INTRODUCTION

**Public Law 100-409.** The Federal Land Exchange Facilitation Act of 1988, Public Law 100-409, was signed into law on August 20, 1988. The primary purpose of the Act is to facilitate and expedite land exchanges involving lands managed by the Departments of the Interior and Agriculture. The legislation recognizes that in order to assure orderly land exchanges, all parties to the exchange must have accurate and timely land data, including surveys and maps. Section 8 of the Act calls for a study and report concerning possible improvements in the handling (collection, storage, use, and dissemination) of certain information related to Federal and other lands. (See Appendix A.)

Previous studies by the National Research Council and by State and private organizations have cited a substantial need for compatible land information systems to improve land conveyance procedures, furnish a basis for equitable taxation, and provide much-needed information for resource management and environmental planning. Some of the studies also suggested that the Federal Government could achieve additional cost savings if it would coordinate its efforts on land information systems.

The Act assigned the responsibility for developing the study mandated in Section 8 to the Department of the Interior (DOI). The DOI assigned to the *Bureau of Land Management (BLM)*, its agency with key responsibilities in land information systems development, the leadership role in the completion of this study. In addition to being the official records agency for public lands, the BLM also has responsibility for the Public Land Survey System, which is the basis for plats that identify legal land parcels in 30 States. The BLM has many additional kinds of information about the lands and the resources it manages, and is currently developing a system that will integrate many of its data systems and lead to an operational land information system.

The Department of the Interior also asked the *U.S. Geological Survey (USGS)* to work closely with the BLM in coordinating the required study efforts. The USGS and the National Institute of Standards and Technology have a Memorandum of Understanding that assigns the lead responsibility for developing, defining, and

maintaining data elements and standards for earth science information systems to the USGS. The National Mapping Division within the USGS also is involved in the development and operation of the National Digital Cartographic Data Base.

In developing the strategy for this study, the guidance issued by the Department of the Interior emphasizes that the study focus on the collection and maintenance of land data, on land information systems at various levels of government, and on improving surveying and mapping activities.

**Study Approach.** The study addresses all topics cited in Section 8 of Public Law 100-409 related to land information and associated activities. These topics include:

**Previous Studies.** Relevant recommendations made by the National Academy of Sciences (National Research Council) on the concept of a multipurpose cadastre.

**Ongoing Activities.** Progress toward development of an overall reference frame for land and resource information, including but not limited to a functional geodetic network, a series of current and accurate large-scale maps, cadastral overlay maps, unique identifying numbers linking specific land parcels to a common index of land records in cadastral systems across the United States, and a series of land data files.

**Roles/Responsibilities.** Ways to achieve better definition of the roles of Federal, State, and local agencies and the private sector in dealing with land information systems.

**Coordination.** Ways to improve the coordination of Federal land information activities.

**Model Standards.** Existing standards, ongoing standards development, and future needs.

**Recommendations for Legislation/Policy Changes.** Items the Secretary of the Interior considers necessary or desirable.

**Team Composition and Consultation.** In an effort to involve all interests specified in Section 8(b) of the Act, and to gain a broad perspective on the issues involved, the BLM established a study team.

John Moeller, BLM's Deputy Assistant Director for Support Services, chaired the study team. Members included representatives of the following agencies and groups:

**Bureau of Land Management**

*John Moeller*

*Pat Korp*

**U.S. Geological Survey**

*Clifton Fry*

*Frank Baxter*

**Department of Agriculture**

*Don Eagleston*

*Gale TeSelle*

*Bill Anthony*

**Department of Commerce**

*Robert Marx*

*Charles Schwarz*

**National Science Foundation**

*Thomas Baerwald*

**National Governors' Association**

*Richard Hayes*

*Lorraine Amico*

**National Association of Counties**

*Jim Golden*

An Ad Hoc Committee organized by the *American Congress on Surveying and Mapping* and the *American Society for Photogrammetry and Remote Sensing* representing professional societies and organizations in public and private surveying, mapping and related fields:

*James Clapp*

*Owen Williams*

The study team addressed each topic in Section 8 by assessing the pros and cons of present land information systems; identifying the desired future situation; and defining the mechanisms and processes that should be established to keep moving toward the ideal situation.

**Methodology.** The members of the study team asked the groups they represented to provide an assessment of the major components of the study objective by responding to the following:

1. Briefly describe the way your organization handles land records and information.
2. Assess in general terms the problems inhibiting the most effective use of this information. For example, is there any duplication of these records by other agencies or offices that require the same information, or are there any problems with the exchange of information at your level or with other levels of government;

3. Specify the desired future state;
4. Define the mechanisms and/or processes that should be established to keep moving toward the ideal state.

The study team also asked these groups to address the issues identified in the legislation:

1. The need for improvements in existing methods of land surveying and mapping, and the costs and benefits associated with such improvements.
2. The need for improvements in existing methods of collecting, storing, retrieving, disseminating, and using information about Federal and other lands, and the costs and benefits associated with such improvements.
3. The adequacy of relevant recommendations made by the National Academy of Sciences (National Research Council) on the concept of a multipurpose cadastre.
4. The ongoing activities concerning development of an overall geographic reference framework for land and resource information, including but not limited to: a geodetic network, a series of current and accurate large-scale maps, cadastral overlay maps, unique identifying numbers linking specific land parcels to a common index of all land records in United States cadastral systems, and a series of land data files.
5. Ways to achieve better definition of the roles of Federal and other governmental agencies as well as the private sector in dealing with land information systems.
6. Ways to improve the coordination of Federal land information activities.
7. The need for model standards for compatible multipurpose land information systems for use by Federal, State, and local governmental agencies, the public, and the private sector; and the organizational responsibility for establishing such model standards.

The study team, which held meetings throughout the process to review preliminary drafts of early chapters and to develop strategies for subsequent chapters, used the information obtained from the assessment to develop a report for the Secretary. Much of the supplementary research was done by the BLM staff which included *Pat Korp*, *Clyde Jones*, and *Otis Jackson*.

## BACKGROUND

**Overview.** There are approximately 108 million parcels of taxable real property in the United States. The records for these parcels are maintained by approximately 83,000 State and local government entities (including counties, municipalities, towns, townships, etc.) In local governments alone, 75 percent of the daily transactions involve land information such as address verification, parcel identification or ownership, budget summaries by district, and delivery of services by location. Further, more than three-fourths of local tax dollars are collected by local property tax, and these taxes account for almost 13 percent of all taxes collected by all levels of government.

Land information is a vital national asset that supports many governmental and non-governmental activities. It is potentially the fundamental link which can connect all levels of government and many of the agencies within those governments. It is collected, stored, used, and maintained by agencies at all levels of government--Federal, State, county, and municipal, and by regional commissions and public utilities, as well as by many private organizations.

Land records typically are found at numerous agency offices in unrelated map and textual formats, such as deed registers, paper files, microfiche, maps, charts, and computer data bases. These records are based on a system of land rights that predates the Constitution of the United States, and are maintained by governments with information management techniques that often are nearly as old.

Even though critical information may exist for a particular parcel of land, it often is difficult to retrieve efficiently and often impossible to relate to relevant information in other land information files. The land data held by one agency or office frequently are "unavailable" to another agency or office, not because of jurisdiction, but because of the method used for record keeping or because of the data format.

This "unavailability" has several costly consequences. For example, it often results in one agency or office duplicating the same information that another agency or office already possesses because the data are not in a

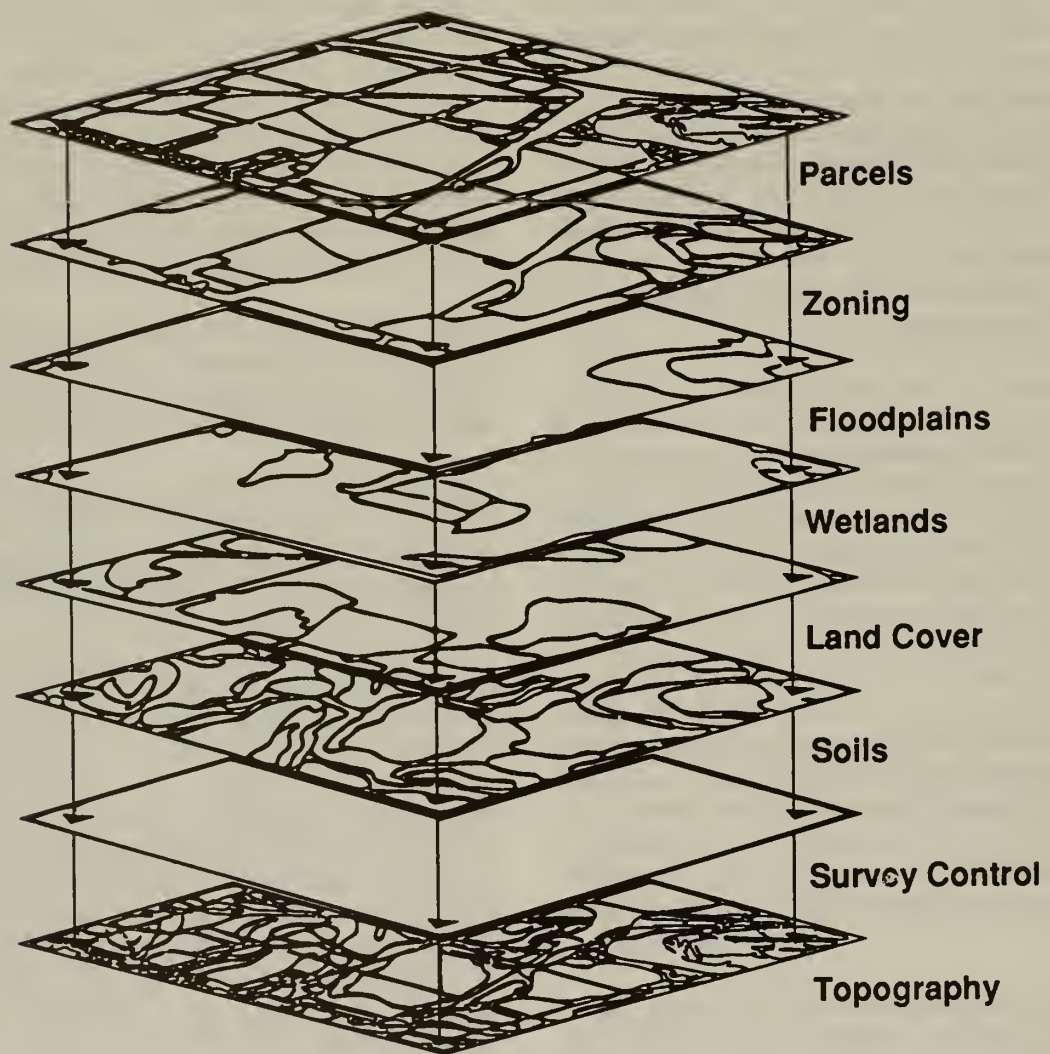
usable format, or because the agency is unaware of the data's existence. As a result, public and private officials often increase the cost of land-related decisions or make land-related decisions with inadequate or inaccurate information. In 1989, the issue surfaced in a popular Sunday newspaper supplement that reported on foreign investments in American lands, stating that it is almost impossible for the public or the Congress to evaluate information on who is purchasing what, or to realize the magnitude of the purchases because documentation is spread through many levels of government.

**Land Information Management.** Effective land information management is essential because many different agencies, organizations, and individuals need land information regularly for many different purposes.

The essence of a land information system is providing the ability to link a multitude of land related attributes, often from many different sources and maintained by many different agencies, to a unique geographic location or area.

To accomplish this, land information managers must rely on a framework that ensures compatibility among many different information systems. This framework should facilitate the sharing of information among decisionmakers and other users in both public and private organizations who require these data for day-to-day policy, management, and operational decisions. Very little has been done on a national level to implement such a process. A comprehensive effort with a national-level emphasis would provide possible solutions leading to the establishment of a framework to achieve compatibility and minimize duplication of land records.

**What is a Land Information System?** For purposes of this report, the term "*land information system (LIS)*" is used, and refers to a geographic information system that is designed to collect, store, manipulate, and retrieve data primarily focused on land parcels an associated water and land records within the legal jurisdiction and administrative boundaries of a governmental unit. This does not mean to imply that all land information is collected and maintained on a parcel basis or that it is collected and maintained only by government agencies.



**Figure 1.**  
**Land Information Systems**  
**The Concept of Layers**

It does mean that there is a need to link information to parcels.

Land information systems may range from manual systems to those that are fully automated. The automated systems provide the capability to graphically display and plot either the data or the results of some data manipulation as they relate to land management, in formats that can be readily used by decisionmakers.

Many terms are used to describe the process and technology that are the subjects of this report. Some of these include "computerized mapping," "digital mapping," "geographic information system (GIS)," "land information system (LIS)," "geo-base information system," "multi-purpose cadastre," and "automated mapping/facilities management (AM/FM). The plethora of terms, and the often resulting semantic confusion are symptomatic of the revolution in land information systems that is the result of advances in computer capabilities and accessibility. This revolution affects one of the basic roles of government and many private industries, i.e., the management and use of information about the land.

A key to understanding an LIS is the general concept of layers. (See Figure 1.) Information in the system can be viewed as being stored in a series of separate layers. For different purposes different layers can be retrieved from the system and combined in nearly every way imaginable. LISs can have dozens, or even hundreds, of separate information layers with data, for example, on parcels, roads, railroads, slope, soils, zoning, sewer service, fire hydrants, flood plains, and land use. (See Figure 2.)

Each layer contains two basic types of information: locational (or spatial) information and text (or attribute) information. The great advantage of an automated land information system comes from the ability to combine locational information and text information. Of all the possible layers, three types are especially important.

First, and absolutely essential, is the geodetic control layer. The function of this layer is to provide a common spatial reference system so that each layer of information

is precisely aligned with the reference system, allowing the combination of information from multiple layers. The most common reference system for State and local use is the State plane coordinate system. The system includes one or more zones per State and covers the entire United States. It locates each and every point in the State by means of a x-coordinate and y-coordinate. The primary systems used by the Federal Government are the Universal Transverse Mercator (UTM) rectangular coordinate system and the geographic coordinate system of latitude and longitude.

The second layer is the base map. Once geodetic control has been established, major land features are placed on the base map layer. The most common cartographic elements are the land transportation network of roads and railroads, political boundaries, and water features. The base map layer makes it much easier to visually relate all other information in the system.

The third important layer contains cadastral information on parcel boundaries and the legal information related to the ownership of the land and associated water. In a land information system, this layer represents the computerized equivalent of a local government's tax maps.

The primary focus of this report is on the future LIS that will be a sophisticated computerized system integrated to manage a variety of data that are geographically referenced or tied to points on the land and can be analyzed in many different ways. However, it is essential to understand that basic data management techniques used to organize land data and improve their quality should be applied regardless of the sophistication of the information management technology used.

It is also important to note that proper organization and high-quality data will enable people to relate the data in an LIS to other information they require about the land. The basic requirement is to have geodetic, cadastral, and cartographic data bases linking both graphic and non-graphic as well as qualitative and quantitative data to all land-related information.

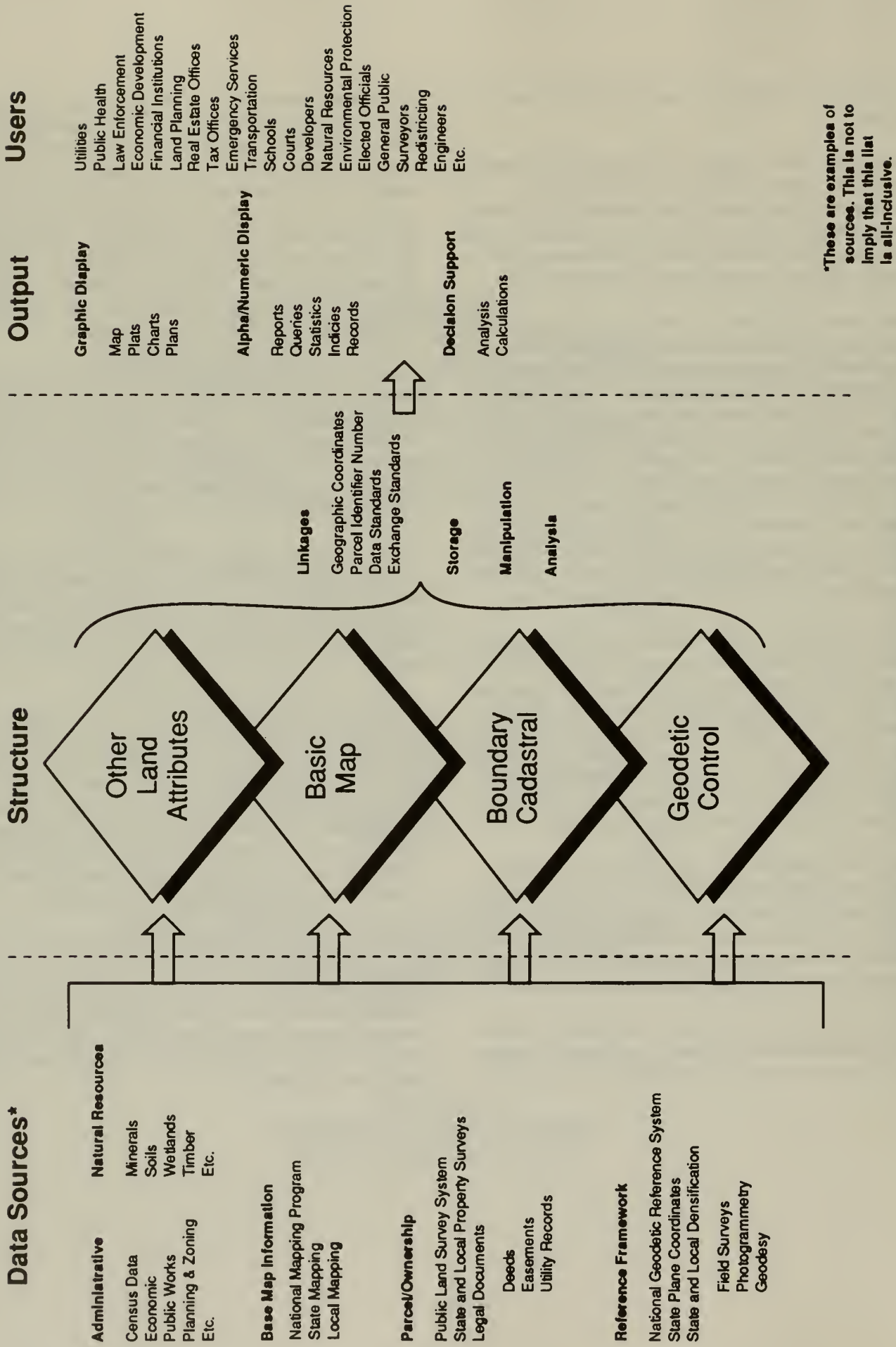


Figure 2. Land Information System Concept



## LAND INFORMATION MANAGEMENT

**Overview.** All levels of government require information about the land to fulfill their basic responsibility--protection and promotion of the health, safety, and welfare of citizens who live on and/or own that land within the national, State, county, or city boundaries. Similarly, private interests--businesses, utilities, real estate offices, developers, and private citizens--require land information. Land is the common denominator for much government information and for many private transactions. Land information is crucial to the decisions at every level of government. Land information management is the process by which we organize, collect, store, retrieve, process, combine, share, maintain, and archive the data that are the building blocks of land information. For example, the Federal Government has many agencies that maintain records by location, e.g. the Department of the Interior manages public lands and national parks; the Department of Housing and Urban Development has information on housing; the Department of Transportation--highways; the Environmental Protection Agency--hazardous waste; the Bureau of Census--demographic and economic information; the Federal Savings and Loan Insurance Corporation--foreclosed properties; the Department of Agriculture--crops, forests, soils; etc. The same is true for other levels of government. In Wisconsin, for example, there are more than 600 State statutes that define responsibility for land information. At the local level, typically three elected officials maintain land information: tax assessors, recorders of deeds, and tax collectors.

The political, legal, and administrative effects of decisions based on land information at all levels of government and in the private sector make it imperative that better ways be found to organize the information as input to the decisionmaking process. Efforts to improve the management of information about the land have been underway since this country was founded. In recent years, many persons have worked together in an attempt to develop a modern, universal system of land records--among them lawyers, recorders of deeds, court clerks, land surveyors, tax assessors, cartographers, demographers, economists, geodesists, planners, computer experts, systems analysts, and other government officials as well as private sector professionals. If an LIS network is developed in a

multipurpose context, a number of different Federal, State, and local agencies could use the same basic data, thereby increasing the benefits and/or reducing overall costs. There is a geodetic network developed for this country by the National Geodetic Survey which provides a framework for a comprehensive network of land information systems; however, nationwide parcel information does not exist, nor are the legal rights and attribute data defined for the land. These data are being created by some Federal agencies for lands they manage, and by certain other levels of government, but not on a comprehensive basis for all of the lands. There is a current revolution in the management of land information that is driven by computer technology. It will affect every aspect of land information and government. The need is so strong and the potential so great that land information managers are beginning to drive some aspects in the development of computer technology itself. Computer technology has revolutionized our ability to manage the world around us by giving us the opportunity to have greater access to information needed to make decisions. More information is not useful unless it can be properly used in cadastre applications. Digital inventories and computer data bases for the land in this country are being developed in many agencies at every level of government. Private interests and utilities often are developing parallel systems. If land information is managed through a coordinated policy that reflects the logical relationships inherent to the land and the way we use it, the duplication that exists in the current systems will be avoided.

**Management Goals.** The basic goals of land information managers are to guarantee the orderly collection, storage, and retrieval of land information. These basic goals take on increasingly complex forms as citizens demand more services, more protection, and more government accountability.

**Organizational and Functional Framework.** The management of land information requires an organization designed to support the process and functions of land management. However, land information management currently is organized around other functions of government that are secondary to land

management. This organizational framework actually resists the comprehensive approach required to support such a basic need. The studies cited in Chapter IV point out the need for a coordinated effort at all levels of government, but especially point out the need at the Federal level where leadership should begin.

If land and its resources are to be effectively managed, it is important to have information about the location and description of the land, with an inventory of its resources, including air and water. Land can be described in many ways, all of which require a physical point or points of reference. These can be as imprecise as "the field next to the fairgrounds" or the parcel "bounded by the creek, the large red stone and the dying oak" which were often used in the earliest survey work done in this country.

A survey frame of reference was created to inventory the vast expanses of the U. S. frontier in the 18th and 19th centuries under the General Land Office (GLO). The GLO initiated a system of land survey identified as the Public Land Survey System (PLSS), commonly called the "township and range" system. This system created a vast rectangular grid that shaped much of the American landscape. However, since effective land information management requires an accurate description of location, a reference framework that is tied to geodetic control is essential.

The National Research Council's 1983 report stated that it is necessary for a reference framework to be tied to geodetic control so that:

- It permits correlation of real property boundary line data with topographic, earth sciences, and other land and land-related data;
- All descriptions of land parcels, easements, and other interests in land required for conveyancing, taxation, and any other purposes should be tied ultimately to the State/Provincial plane coordinate system.

**Parcel Identifiers.** Once the land can be located, the components must be identified so that they can be tracked through time. Land records are managed by using identifiers that are unique to each separate entity, which is generally the land ownership parcel.

The parcel is defined as: *"...a contiguous area of land described in a single description in a deed or as one of a number of lots on a plat; separately owned, either publicly*

*or privately; and capable of being separately conveyed. For ease of indexing data, a segment of a street, highway, railroad right-of-way, pipeline, or other utility easement may be treated as though it were a parcel."* (Moyer & Fisher, 1973.)

These data are maintained in public cadastres, or real estate property tax records, by local governments. Because the parcel is a fundamental unit of land that defines the location and the rights to the use of that land, there is a need for an accurate and continuously updated map of parcel boundaries within a given jurisdiction to which all other layers of graphical data and attribute data can be referenced through the use of a parcel identifier, i.e., a parcel-based index. Moyer and Fisher define a parcel identifier as a finite, punctuated sequence of numeric and/or alphabetic symbols that are used as shorthand for referring to a particular parcel in lieu of its full legal description. The parcel identifier does not describe the parcel; rather, it is used to uniquely index and identify data that refer to that particular parcel. The full legal description of the parcel is one of the data sets that is indexed by the identifier. The parcel identifier, in order to meet the needs of an LIS, must meet the identification and indexing needs of various applications and of various system designs in present use. This capability can be referred to as "compatibility" and is defined to encompass three concepts of versatility: (1) the identifier must be capable of serving efficiently for each kind of land-related data, including not only land title information but also the myriad categories of land use and other related data; (2) the identifier system must be suitable both for computerization and for low-volume manual processing; and (3) in addition to its appropriateness for the local situation, the identifier should be capable of incorporation into a national land information system.

**Developing a Land Information System.** Once the basic components, including land parcel size and location, are adequately defined, the characteristics of the land can be more fully described. Knowing the size, location, and boundaries of a parcel are only partial data elements. In order to make decisions about each parcel of land, it is necessary to know the characteristics of the land. These qualitative descriptions are physical and administrative. Examples of physical characteristics include soils, geology, hydrology, vegetation cover, climate, and other categories. It is also necessary to know how the land is being used (agricultural, commercial, residential, etc.) These data reflect inventory needs used to manage land.

**Data Collection.** Data collection to support land information systems is underway at almost every level of government and at many offices in the private sector. These data collection efforts are not always coordinated and in many cases fail to adhere to appropriate standards. The work of data collection and maintenance represents a major investment in developing a land information system. To preserve the future value of this important public asset, the collection and maintenance work must be consistent in its adherence to standard procedures, and the level of confidence in the accuracy of each sector of the data base must be known. The importance of these procedures is underscored by the findings of a survey of 174 experts in computerized land data systems. The two factors most often rated high in importance for successful implementation of a land-data system were (1) a defined responsibility for the sources and accuracy of each record, and (2) standards for the quality of data that may be entered. (Lincoln Institute of Land Policy, 1982.) Data collection efforts are of two general types: initial, comprehensive data base building efforts and data base maintenance efforts. The former type of effort is necessary whenever new applications require additional data or whenever data maintenance efforts have been badly neglected or are currently inadequate to keep abreast of changes.

**Data Sources.** The primary data source for geodetic control is the National Geodetic Reference System. These data adhere to national standards and are coordinated by the Federal Geodetic Control Committee. Existing cadastral maps and land records are the primary source for parcel data. However, these are not always of very high quality and are usually without geodetic control. This leads to problems when the need arises for comparisons with data from other sources. Referencing cadastral boundaries to geodetic control could be the most costly phase of LIS development. Sources for other descriptive data, physical and administrative, are many and vary from poor to excellent in quality. The physical data are often in cartographic form but satellite imagery has also created large quantities of digital data. The bulk of administrative data on land use is produced by local government, but every level of government produces descriptive information about land.

A statement of the existing situation with respect to publicly available land records was developed in cooperation with the Executive Director of the *International Association of Assessing Officers*: "The one official with a mandate to perform a public duty annually

with respect to every parcel of real estate in a given jurisdiction is the tax assessor. The duty is to value each taxable parcel as prescribed by law, and to place that value on a record open to the public, and to place on a comparable public record each parcel exempt from assessment by law for the year in question. This means that the assessor must keep an inventory of real property in the jurisdiction that is inherently more comprehensive than that kept by any other public official. That inventory contains information on location, physical characteristics of land and buildings, use, value, ownership, and taxability. The representation of each parcel on a cadastral map is an essential part of that inventory. In the past, assessors often accepted as adequate, cadastral maps that were imprecise and incomplete. This is changing, in part because restive taxpayers increasingly insist on assessments at levels of value the law prescribes, and errors in maps can easily jeopardize the achievement of such assessments. It is also changing because technology today makes possible mapping that can efficiently and simultaneously serve more functions than assessing, with improved accuracy for each. The two elements of the assessing function that require "mass" treatment within time deadlines--mapping and valuation--now yield to attention by the assessor annually, thanks to computerization. In this kind of environment, the assessor becomes an eager pioneer in the development, use, and maintenance of modern land information systems."

The chairs of two committees of the Real Property, Probate, and Trust Section of the *American Bar Association* (the Surveys Committee and the Improvement of Land Records Committee) have issued a statement on the existing situation with respect to land records requiring the attention of members of the American Bar Association: "At present, publicly available land records relating to ownership, description, and valuation of real property cannot be depended upon as a consistent source of information for cadastral definition. Public real property records are not uniformly available in the form and with the substance necessary for integration into a geographic information system. This is not surprising, since standards and practices for recording and survey-based descriptions on deeds are often inadequate for incorporation of information into automated record keeping environments. Thus, while the local depository for title records should be the source of the cadastre in a land information system, the cadastre is more often a product of dubious accuracy from a combination of sources such as aerial photographs, unreferenced deed descriptions, and existing, manually maintained assessors' maps."

**Data Conversion.** The conversion of data from paper form to computer readable form is a very expensive part of developing an LIS and, therefore, is one of the most significant obstacles to the development of an automated land information system. Data conversion requires a clear understanding of data content, quality, and logic. Quite often, it requires interpretation of maps and data based on old records that refer to features that are no longer in place. It is a labor-intensive process that requires expert attention to avoid significant problems in data comparison and in future costs.

Industry is responding to data collection and conversion bottlenecks with new technology. Global Positioning Systems (GPS) enable surveyors to collect precise geodetic data in a fraction of the time formerly required. Scanning devices have improved the conversion of graphic to digital information. The use of optical character recognition devices may make the encoding of attribute data nearly as easy. Primitive "intake" processes for creating public land records will not yield a product likely to accommodate modern archiving processes. There needs to be an effective response to the issues of content, access, and liability that are fundamental and critical in the development of modern land information systems. While modern LIS requirements call for parcel descriptions to be referenced, this has not been required of the conveyancing community. Future conveyances can only be a primary source of information if boundary descriptions are required to be referenced to an absolute reference system such as the State Plane Coordinate System, and if deed records are designed to be automated and integrated into the total LIS. Developments in the computer industry generally benefit LIS applications. In particular, the improvements in distributed data bases, geographic information systems, automated cartography, and communications networks mean that each organization can be responsible for the data it creates, but the data base can be administered as a corporate resource available to all. This allows for the institutionalization of an LIS.

**Barriers to a Coordinated Network.** At present the most significant constraints inhibiting the effective utilization of land information are the institutional barriers. This is caused by the evolution of the institutions themselves and their historical focus on organizational missions.

Consider, for example, the institutional structure of local governments. Approximately two hundred years ago, when this Nation was founded, local government had

essentially one administrative office, that being the registrar of deeds. In the years since, local governments have established other offices to address the needs of citizens, e.g., water utilities in the 1890s, assessors in the 1920s, transportation in the 1930s, zoning offices in the 1950s, and environmental protection in the 1970s. Today there are typically 30 offices in each local government with some land information responsibility. Each office may organize and manage land data specific to its mission, but may also duplicate some data managed by other offices for the same land.

The Federal and State government responsibilities have grown along similar lines with the management of the census, water districts, grazing land, oil reserves, forests, environmental hazards, disease control, etc. The need for basic land information is found at every level of government. The institutions are fulfilling their missions, but there is limited coordination of the basic element that ties them all together--land information. **The problem that results most often** in the current state of affairs in the management of land information is the lack of accessibility. A government official or private citizen requests information that is not available because it has not been collected, is outdated, or requires unreasonably long or difficult searches.

Another significant problem is the duplication of data and effort. Different levels of government collect the same data for different purposes. For example, the Federal Government might collect data and produce national or regional summaries to highlight a hazardous waste problem, but organizes the data so that they cannot be analyzed at the State or local level where most of the threat or land management actually occurs. It may be merely a matter of scale, but could result in the duplicate collection of the same data by the State or local governments involved.

Initial costs associated with the development of an integrated LIS, including data conversion costs, are additional barriers. Confidentiality is also an issue that can limit land information sharing when one or more items in the data are subject to legitimate restrictions on distribution. Another barrier deals with education, particularly at the management level. There is a need for interdisciplinary programs, or perhaps a new discipline in universities and colleges to train new managers and professionals, and to provide continuing education for those already in the work force.

**Economics of LIS.** The economics of land information are driven by two factors:

1. The high costs currently incurred from handling land information matters, and
2. The rapidly expanding scope of problems for which land information is pertinent.

Current costs of producing new land records and maintaining land information systems are both large and increasing at a rapid rate. While the growth of LIS investments is increasing rapidly, the rate is small compared to the pace at which demands are growing for information to deal with land-related issues. The LIS field is literally exploding as users of land data rush to obtain the technology that they see as an answer to their land information problems. For example, it has been estimated that local governments and utilities will spend between \$45 and \$90 billion over the next ten years on automated information systems to manage the Nation's infrastructure. The decisionmaking needs and the available technology are creating a large demand for LIS products and services. But because of shortcomings in the institutional aspects of land information, these technologies are not being put to the most effective use. Money is wasted on systems that are narrowly focused. These "pieces" are not adding to the broad framework of a multipurpose land information system.

**Opportunities.** The management of land information should be a process that can assist decisionmakers with the effective administration of land throughout the United States. It should expeditiously provide accurate and complete information to the general public and be prepared to respond to change at all levels of government. This can only be done through the coordination of independent efforts, the effective use of technology by government organizations that are implementing an LIS, and the adequate financing of systems improvements. Government agencies and others using land information systems have an opportunity to coordinate related activities and take advantage of advanced technology. Within every county or city there needs to be a framework able to support basic map and other land attribute information and to serve as a framework for referencing spatial data for parcel information. **Current technological developments**, especially in satellite surveying, provide a new opportunity to create the necessary geodetic network in a shorter time, with greater accuracy, and at a lesser cost than more traditional technologies. Uniform base maps and automated cartographic data provide a reference for cadastral and infrastructure information and for efficient integration of

land use information. The base maps must be accurate enough to display property information, and must be tied to the geodetic framework. Improvements in automated cartography offer an opportunity for vast improvements in the management of land information. Hardware and software to support this industry are advancing rapidly, while at the same time the cost of the technology is dropping. The technology behind all information management is advancing very rapidly, benefiting both the graphic and non-graphic elements in land information. Land information managers need to take advantage of existing and developing data base management capabilities which shorten system development time, increase flexibility, and lower maintenance costs. The advances in networking systems and simplified user interfaces also present an opportunity to make fundamental changes in productivity and maintenance activities related to land information systems. However, due to the lack of land information policies and programs at all levels of government, the full benefit of this opportunity is being missed.

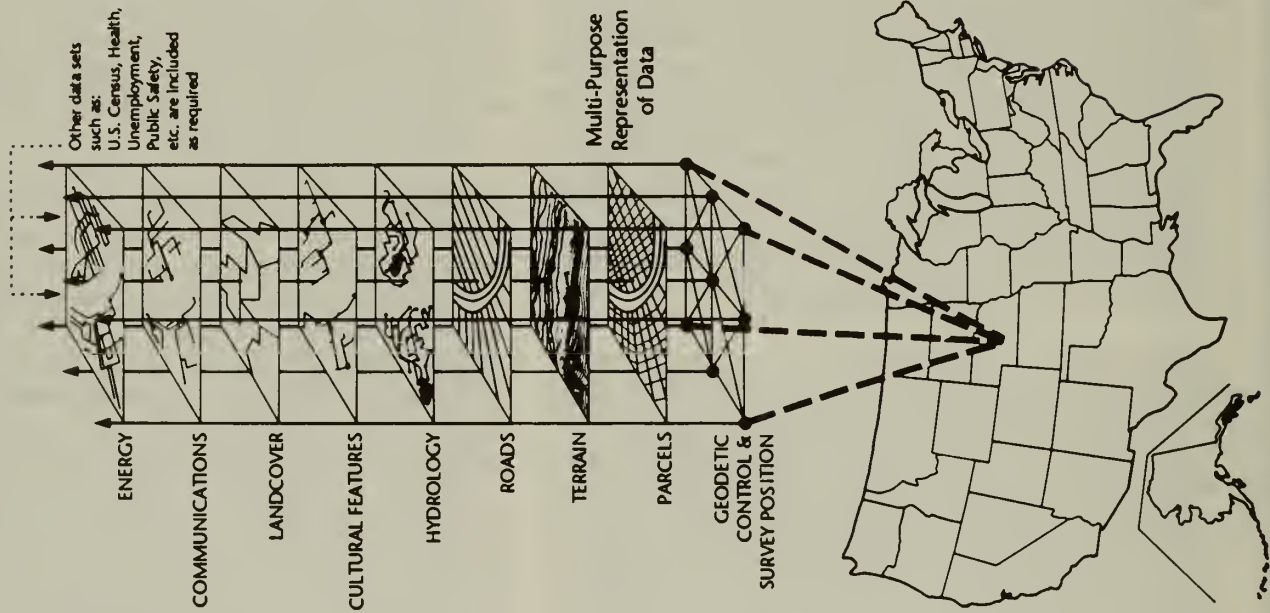
**Summary.** Most departments in local government collect, use, and/or alter land data. Public works, tax assessing, planning, zoning, and deed-recording offices are among government departments typically involved in collecting and sharing land information. Different levels of government also have the need to share information to accomplish their assigned responsibilities or to reduce duplication of data collection efforts. Similarly, numerous private interests ranging from utilities to realtors are collecting and, sometimes, sharing land information. However, if the various systems do not use uniform standards, or if they are not tied to a common land survey base, the sharing of data is difficult, if not impossible. The development of a coordinated land information system is not necessarily an objective that can be achieved in one step. Implementing actions must be tailored to the needs and capabilities of the individual organizations. (See Figure 3.) Therefore, the concept of a national integrated land information management system is needed. The components that all land information systems should contain are:

- Geodetic control in the form of geographical or rectangular coordinates;
- Basic map information, including roads, hydrography, and cultural features;
- Property boundaries, including a unique identifier for land parcels; and
- Land attributes, including legal rights, and land use information as needed by the particular jurisdiction.

# LIS NETWORK COORDINATED - INTEGRATED FUTURE NEED ORIENTED

## REQUIREMENTS

- Use Geographic Coordinates
- Parcel Based
- Adopt Common Standards
- Use Parcel Identification Numbers
- Use Available Data Sources
- Open (or non-proprietary) hardware, software, and telecommunication standards



## CHARACTERISTICS

- Data Sharing
- Each LIS locally or agency managed
- Adopt and follow requirements
- Local systems contribute to national or regional scale systems
- National or regional systems contribute to local systems
- National leadership with local control and operation
- All systems oriented toward contribution to the network

## Chapter IV

# ISSUES IDENTIFIED IN PREVIOUS STUDIES

**Overview.** A number of previous studies have looked at the topics of managing land information and surveying and mapping. Several of these studies were cited in the legislation that mandated this study. Others were identified by the Section 8(b) study team as having relevance. For the purposes of this report, the recommendations of ten of these studies were reviewed. This chapter summarizes the recommendations and presents an analysis of progress that has been made on these recommendations. The chapter is divided into two sections. The first is a summary of the studies that were referenced in Public Law 100-409. They include:

**Need for a Multipurpose Cadastre,** National Research Council. 1980.

**Federal Surveying and Mapping: An Organizational Review,** National Research Council. 1981.

**Modernization of the Public Land Survey System,** National Research Council. 1982.

**Procedures and Standards for a Multipurpose Cadastre,** National Research Council. 1983.

The second section summarizes the recommendations of six other studies that have also dealt with the increasing concern about the management of land records. These studies include:

**OMB Report of the Federal Mapping Task Force on Mapping, Charting, Geodesy and Surveying.** 1973.

**Land Title Mapping and Surveying Research Report,** prepared for U.S. Department of Housing and Urban Development. 1978.

**Monitoring Foreign Ownership of U.S. Real Estate--A Report to Congress,** study conducted by Gene Wunderlich, D. David Moyer, Peter Debraal, and Karl Gertel et.al. for the U.S. Department of Agriculture. 1979.

**Final Report of the Wisconsin Land Records Committee: Modernizing Wisconsin's Land Records.** 1987.

**The Application of Geographic Information Systems Technology to the National Flood Insurance Program,** Federal Emergency Management Agency, Federal Insurance Administration. 1987.

**Fragile Foundations: A Report on America's Public Works,** National Council on Public Works Improvement. 1988.

## SECTION ONE

This Section summarizes the recommendations of four studies referenced in Public Law 100-409, and also lists several Federal actions that contribute to the coordination of land information.

**Need for a Multipurpose Cadastre,** National Research Council. 1980. (*Note: Multipurpose cadastre is synonymous with an LIS.*)

1. Federal legislation should be proposed to authorize and fund a program to support the creation of a multipurpose cadastre in all parts of the Nation.
2. The Office of Management and Budget should designate a lead agency for the multipurpose cadastre.
3. Technical studies should continue to be sponsored by the Federal Government to identify consistent land information and to display standards for use among and within Federal agencies and between Federal and State Governments. These studies should rely on the authority of State governments to adopt the standards and organize the data collection, in cooperation with the Federal Government, to ensure compatibility on a national basis, delegating these functions to local governments where appropriate.
4. Each State should authorize an Office of Land Information Systems, through legislation where necessary, to implement the multipurpose cadastre.
5. County government (or municipality where appro-

priate) should create an Office of Land Information Systems in coordination with such offices as the recorder of deeds, county surveyor, assessor, planner, and county abstractor, if any.

6. Local governments should be the primary access point for local land information.
7. The Federal Government should support the establishment of a center or centers of excellence in land-information science, for the purpose of providing a program that develops scholars and professionals. The curriculum should include direct experience with land-data-systems problems.

**Federal Surveying and Mapping: An Organizational Review, National Research Council. 1981.**

1. There should be a single agency, a Federal Surveying and Mapping Administration, for civilian mapping, charting, geodesy, surveying, and the multipurpose cadastre.
2. The mapping, charting, geodesy, surveying, and cadastral agencies of the Federal Government should continue to sponsor cooperative programs, with State and local governments providing sufficient guidance to ensure conformance to national specifications and standards and thus to the development of a fully integrated national information system.
3. Geodetic and cartographic data bases should be adequately supported, be readily accessible to all users, and even though serving different interests and needs, be made integral parts of a national mapping, charting, geodesy, surveying, and a multipurpose cadastre information system.
4. The program for the marine data base should be adequately supported and the data base should also be made an integral part of a national mapping, charting, geodesy, surveying, and a multipurpose cadastre information system.
5. A national strategy for the multipurpose cadastre within the proposed Federal Surveying and Mapping Administration should be recognized and supported and the multipurpose cadastre should be fully coordinated with the surveying and mapping programs.

**Modernization of the Public Land Survey System (PLSS), National Research Council. 1982.**

1. The Department of the Interior should clarify the responsibilities for PLSS maintenance. The Committee recommends that the Department conduct investigations into the present condition and future role of the PLSS. This should include a review of Federal law and authorities, state and local law and authorities, the condition of PLSS records within state and local government, and state and local programs and private and semi-public activities affecting modernization of the PLSS.
2. The Bureau of Land Management (BLM) is urged to change priorities, procedures, and standards to establish coordinates that meet recommended multipurpose cadastre standards for corners on Federal-private interface lands.
3. The Committee recommends that responsibility for establishing and maintaining a national digital coordinate PLSS data base be placed with the BLM in cooperation with the National Geodetic Survey. This file should include data on the source and estimated accuracy of each position. We recommend that the Office of Land Information Systems, proposed in the report *Need for a Multipurpose Cadastre*, be established in each state and be responsible for maintaining a file of PLSS corner coordinates determined by state or local units according to national standards established by BLM. The Department of the Interior should develop mechanisms whereby private and semi-public units can contribute PLSS corner coordinate data to the file maintained by the proposed State Office of Land Information Systems.
4. To facilitate the task of integrating spatial data files, the Committee recommends that the Department of the Interior report on the positional accuracies of all PLSS corners and on the positional accuracies and spatial resolution of all their resource inventory files. The Cadastral Survey Division of BLM should express survey results in terms of point accuracies as well as closures. All agencies contributing data to the PLSS digital coordinate data base should assess and maintain records on the unit cost and accuracy of coordinates they derive.



**Procedures and Standards for a Multipurpose Cadastre,**  
National Research Council. 1983.

1. This report reaffirms the statements in the 1980 report regarding the need for a multipurpose cadastre at all levels of Government in the United States and suggests the outlines of procedures and standards that will be required for its design and implementation. It is intended to assist both the local governments wishing to pursue the development of cadastral records systems for their own counties or equivalent districts and also the many other regional, State, and Federal agencies, as well as private businesses, whose participation will be needed.
2. The State Plane Coordinate Systems should be used as the basis of the multipurpose cadastres in each state. Monumented points of known location on this system should be distributed throughout the area served, at intervals no greater than 0.2 to 0.5 mile in urban areas and 1 to 2 miles in rural areas.
3. A central office in the government of each county (or municipality, where appropriate) should be assigned the responsibility of managing the development of the systems of maps and files that will constitute the multipurpose cadastre for that locality and of compiling the common set of standards for definitions of data elements, accuracy, frequency of updating, and completeness of the records. To assure compatibility these standards should be developed in cooperation with other jurisdictions, including state and Federal governments.
4. A program of Federal grants to counties (or their equivalents) should be established to provide between 30 to 50 percent of the cost of developing multi-purpose cadastres that meet or exceed Federal requirements subject to participation of the State government in the design and partial funding of the program.
5. The National Association of Counties, through its appropriate constituent organizations and staff, should organize a review of the findings and recommendations of this report, involving representatives of local user agencies, and to identify the areas in which more specific standards and procedures are most needed to make the approach described here operational.

While these studies have considered widely varying aspects of the problems of the existing land information system in the United States, the resulting conclusions or recommendations have been relatively consistent on several major points:

1. There is a critical need for a better land information system in the United States.
2. Land records in the U.S. are not uniformly related to a high quality geodetic survey system necessary to avoid costly errors and repetitive effort in the use and cross-referencing of such records in national development and resource management.
3. Modernization of land information now underway is largely uncoordinated and does not generally result in systematic information systems permitting the fullest and most efficient use of the data by all potential users.
4. The relationships among Federal, State, and local governments in land information activities are basically correct, but significant improvement is required in coordination and standardization. (The major part of the effort should continue to be applied at the county and municipal level with guidance, assistance and coordination at the State and Federal levels.)
5. Technological advances in geodesy, photogrammetry, digital cartography, land surveying, information systems, and the computer sciences are providing the foundation for achieving a truly integrated land information system.
6. A lack of Federal leadership is seriously impeding the effective application of the developing technology, resulting in rapidly escalating, unnecessary national costs from duplication of effort and from inefficient maintenance and application of land information, estimated to be in the hundreds of millions of dollars per year.
7. A formal, legislative designation of a national land information system is required, setting out clearly the concept of a joint Federal, State, and local government system operating under prescribed standards to achieve the goals of a multipurpose land information system, with appropriate funding authorization.

8. Local governments should be the primary access point for local land information.
9. Because of the many agencies at all levels of government that contribute data to and are users of the land information system, there should be a focal point, e.g., office of land information, established in each State, county, and municipal government to assure effective coordination and to establish priorities and resource requirements.
10. OMB should revise and update Circular A-16, which provides for coordination of mapping and geodetic surveying at the Federal level, but does not include cadastral surveying or LIS activities, and which has not been updated since 1967. *(Note: This Circular is currently being revised.)*
11. At the Federal level, there are more than 39 agencies involved in surveying, mapping, geodesy, and related land information operations without any focal point for managing the national programs. These activities should be transferred into a new single agency for civilian mapping, charting, geodesy, and the multi-purpose cadastre, operating as a parallel organization to the Defense Mapping Agency.
12. There should be Federal support for developing educational excellence in land information science to assure availability of scholars and professionals.

Several Federal actions that have been initiated contribute to the coordination of land information activities. These include:

**The Office of Management and Budget (OMB) Circular A-16, Coordination of Surveying and Mapping Activities, Revised 1967,** established a policy for surveying and mapping and delegated the responsibility for geodetic and related surveying to the Department of Commerce, the responsibility for mapping to the Department of the Interior, and the responsibility for international boundaries to the Department of State.

**The Federal Geodetic Control Committee (FGCC)** was organized to assist the Department of Commerce in meeting the requirements of OMB Circular A-16 to coordinate geodetic and related survey activities, thereby avoiding duplication. The FGCC consists of representatives from eleven Federal departments and independent agencies to develop and publish standards, specifications, input instructions for producers and users of geodetic control and related surveys.

**The Federal Interagency Coordinating Committee on Digital Cartography (FICCDC)** was created in 1983 to coordinate the digital cartographic activities of Federal agencies and to continue collecting, analyzing, and publishing information about Federal digital cartographic activities. The FICCDC consists of representatives from eleven Federal departments and agencies that have the capability to produce digital cartographic data. It is chaired by the Department of the Interior (USGS).

**The Interior Digital Cartography Coordination Committee (IDCCC)** was established in 1982. The U.S. Geological Survey was assigned the responsibility for establishing a focal point within the Department of the Interior for the production, storage, access, and distribution of a National Digital Cartographic Data Base. Nine Interior bureaus and offices serve on the committee.

**The Paperwork Reduction Act of 1980** was passed to enhance the economy and efficiency of the Government. Specifically, its purpose was to minimize Federal information costs, mandate coordination, integration and uniformity with respect to Federal information.

**OMB Circular A-130, The Management of Federal Information Resources,** implements provisions of the Paperwork Reduction Act. It specifically requires agencies to share their information technology facilities with users from other agencies to the maximum extent feasible.

## Status of Implementation of Recommendations in Previous Studies

**Federal.** At the Federal level, the recommendations of the National Research Council to bring surveying and mapping and related land information activities together into a single agency has not been acted on. As noted earlier in this chapter, several inter-agency committees have been established to deal with various aspects of land information systems including geodesy, digital cartography, and Federal land records. Individual agencies work with various state and local agencies on a case-by-case basis (the National Geodetic Survey on geodetic surveys and geodetic data support; the USGS on cooperative topographic mapping; the BLM on the Public Land Survey System; the National Science Foundation has funded an Educational Center for Geographic Information Land Analysis, etc.) but there is no longer any focal point for such activities since the Office of Management and Budget eliminated the Office of the Coordinator for Surveys and Maps. The concept of a national cadastre also has not been adopted.

**State.** Some States, such as Oregon and North Carolina, have implemented the National Research Council's recommendation to establish a surveying and mapping focal point for coordinating LIS efforts within each State and for allocating State funds to support county programs for improving land records and related information. Most states, however, have not established such a State focal point nor have they worked toward applying standards to move toward an integrated land information system in the State. Further, even in most States that have initiated a statewide approach to LIS, funding support is often allocated in response to specific requests by individual counties without requiring that the project be consistent with a statewide land information system.

**County.** Many counties have embarked on programs for improving some aspects of their LISs, particularly those operated by tax assessor/property appraiser offices. These have generally been developed by systems vendors and reflect various levels of technology and concern for data base quality. There has been little coordination between counties and the States in the development of these systems. Some counties have established surveying and mapping focal points as recommended by the National Research Council and are moving toward integrated systems with high-quality geodetic referenced data bases serving all potential users. While there

is considerable effort to exchange technical information about systems, there is little effort to develop a regional approach to bring individual county systems into compatible systems that could lead to exchange or consolidation of data within the State or region. Federal and State funding support, where available, is generally provided to individual county projects in response to proposals from individual counties, without reference to a coordinated LIS approach.

**Professional/Technical/Trade Associations.** Coordination of LIS interests among the several involved professional, technical, and trade associations (such as: American Congress on Surveying and Mapping (ACSM); American Society of Photogrammetry and Remote Sensing (ASPRS); Urban and Regional Information Systems Association (URISA); AM/FM International (automated mapping/facilities management); Association of American Geographers (AAG); American Society of Civil Engineers (ASCE); International Association of Assessing Officers (IAAO); the American Public Works Association (APWA); the American Planning Association (APA); the Lincoln Institute of Land Policy; the Management Association of Private Photogrammetric Surveyors (MAPS); etc.) continues to improve, as evidenced by the success of such activities as the Joint GIS/LIS Committee, the GIS/LIS annual meeting, support for the Institute for Land Information (ILI), seminars at regional levels, and expanding publication programs. Some of the positions taken in conferences continue to support the design and development of independent LIS data bases for specific utility requirements, which results in significant investment of taxpayer and rate payer funds in systems that do not meet the total public need for an integrated LIS.

In summary, while there has been considerable progress in improving the quality of land information systems, both in geodetic reference quality and in data servicing, there has been less progress in developing a coordinated system to address the total requirement. (See Figure 4) A coordinated system will help provide the uniform high quality land information data base that is critical to the management of national development and resources. Implementation of the National Research Council recommendation to establish a focal point in government for coordinating the total effort would be a positive step to reach that goal.

PREVIOUS STUDIES	Critical Need for Better Land Information	Land Records are not Rated to High Quality	Geodetic Reference System	Current Efforts Uncoordinated and not Meeting Full Potential	Inter-Governmental Relations Require Greater Coordination	Technological Advances Provide Foundation for Integrating Land Information	Lack of Federal Leadership	Formal Legislation for a National LIS Policy is Required	Local Govts. Should be Primary Access for Local Land Information	There Should be Primary Organizational Unit in Federal, State and Local Governments	OMB Should Review & Upgrade Agency Established for the Surveying, Mapping and Geodesy	There Should be Federal Support for the Development of Educational Programs
Need for a Multipurpose Cadastre, NRC, 1980	•	•	•	•	•	•	•	•	•	•	•	•
Federal Surveying and Mapping: An Organizational Review, NRC, 1981	•	•	•	•	•	•	•	•	•	•	•	•
Modernization of the Public Land Survey System, NRC, 1982	•	•	•	•	•	•	•	•	•	•	•	•
Procedures and Standards for a Multipurpose Cadastre, NRC, 1983	•	•	•	•	•	•	•	•	•	•	•	•
OBM Report of the Federal Mapping Task Force on Mapping, Charting, Geodesy, and Surveying, 1973	•	•	•	•	•	•	•	•	•	•	•	•
Land Title Mapping and Surveying Research Report, HUD, 1978	•	•	•	•	•	•	•	•	•	•	•	•
Final Report of the Wisconsin Land Records Committee: Modernizing Wisconsin's Land Records, 1987	•	•	•	•	•	•	•	•	•	•	•	•
The Application of Geographic Information Systems Technology to the National Flood Insurance Program, FEMA, 1987	•	•	•	•	•	•	•	•	•	•	•	•
Monitoring Foreign Ownership of U.S. Real Estate, USDA Report to Congress, 1979	•	•	•	•	•	•	•	•	•	•	•	•
Fragile Foundations: A Report on America's Public Works, National Council on Public Works Improvement, 1988	•	•	•	•	•	•	•	•	•	•	•	•
THIS STUDY	•	•	•	•	•	•	•	•	•	•	•	•
												Recommend more Study in Light of New Technologies

Figure 4

Summary of Recommendations of Previous Studies

## SECTION TWO

The second section of this chapter summarizes the recommendations of six other reports that have also dealt with the increasing concern about managing land information.

### **OMB Report of the Federal Mapping Task Force on Mapping, Charting, Geodesy and Surveying. 1973.**

1. Facility, cadastral, geodetic, and mapping control surveys should be coordinated, with the objective of building a truly national multipurpose control system.
2. A national urban mapping and surveying program should be established to bring together many uncoordinated and sometimes inadequate activities.
3. The mapping programs of various agencies should be coordinated and a national multipurpose intermediate-scale product should be developed.
4. Department of Defense advanced technology should be made available in the civilian communities through a central civilian focal point.
5. A national photographic data base should be created and a mechanism to assemble, review, coordinate, and validate civilian agency photo requirements should be developed.
6. A common reference system (standards and specifications for using and displaying spatial data and coordinating the development of information systems related to this area) should be established.
7. A single civilian surveying and mapping agency should be created by transferring such activities from the 39 Federal agencies involved, with sufficient authority to coordinate these activities with similar activities outside the Federal program.
8. Private cartographic contract capability is not being used sufficiently. We found this capacity to be broad and varied and capable of rendering skilled support; contract capability is a viable alternative.

**Land Title Mapping and Surveying Research Report**, prepared for U.S. Department of Housing and Urban Development. 1978.

Several practical and cost-effective approaches to land title related mapping and surveying activities have been identified. If implemented, these approaches could improve mapping and surveying practices in local jurisdictions in the United States. The six recommended actions can be implemented independently or collectively to maximize mapping and surveying support of land title systems:

1. Property ownership maps should be created to support parcel indexing and the assignment of parcel identification numbers.
2. Parcel identification numbers should be implemented which are simple and which use existing numbering conventions where possible.
3. Parcel index numbers should be required on all documents to be registered or recorded.
4. Parcel index maps should be updated during the recordation or registration process.
5. Boundary surveys should be recorded or registered and indexed by parcel identifier.
6. National property ownership map maintenance standards should be developed and disseminated to standardize and improve map quality.

**Monitoring Foreign Ownership of U.S. Real Estate - A report to Congress, study conducted by Gene Wunderlich, D. David Moyer, Peter DeBraal, and Karl Gertel for the U.S. Department of Agriculture. 1979.**

The following four alternative sources of information on foreign investment in U.S. real estate were considered:

1. A centralized Federal registration system with the burden of responsibility of registering on the foreign entity or his representative. (Congress selected this option by passing Public Law 94-460, the Agricultural Foreign Investments Disclosure Act, which requires foreign owners of farm or forest land to register with the Secretary of Agriculture.)
2. A Federal system utilizing available sources (Securities and Exchange Commission, Federal Trade Commission, Internal Revenue Service) to which foreign investors may already be or would be capable of reporting.

3. A national multipurpose land-data system, including data on foreign direct investment, oriented to local government records, principally tax assessment, but including title records, land-use records, and county offices of Federal agencies.
4. Periodic statistical surveys, to provide standard nationwide data on land ownership, such as those of the Bureau of Census and the U.S. Department of Agriculture rural land-ownership survey.

**Final Report of the Wisconsin Land Records Committee: Modernizing Wisconsin's Land Records. 1987.**

The Wisconsin Land Records Committee formally recommended to the Governor the establishment of a Wisconsin Land Information Program, a long-range strategic mechanism by which Wisconsin can guide the development of modern, efficient Multipurpose Land Information Systems. The Program also offers a flexible process through which to implement and maintain these systems.

- *Immediately:* Review current methods of land records collection and maintenance, and provide technical assistance to public agencies seeking to improve these methods. Assist with modernization activities that encourage the development of Multipurpose Land Information Systems.
- *In the Short Term (within the first five years):* Help local and state government agencies modernize land records in ways that will be consistent with eventually adopted statewide guidelines.
- *In the Long Term (within the next five to ten years):* Continue these activities with an emphasis on developing and adopting guidelines for Multipurpose Land Information Systems.

The Committee recommended that the Wisconsin Legislature establish a Wisconsin Land Information Program with the following components:

- Land Information Board;
- Office of Land Information;
- Grants-In-Aid Program;
- County Land Information Units.

**The Application of Geographic Information Systems Technology to the National Flood Insurance Program, Federal Emergency Management Agency, Federal Insurance Administration. 1987.**

As preliminary steps for moving the National Flood Insurance Program (NFIP) towards an automated environment for the management of spatial information the following actions are recommended:

1. One community with existing digital parcel data be selected for a pilot test of combining digital Flood Insurance Rate Maps (FIRM) data with community digital parcel data;
2. The addition of horizontal control for FIRMS be implemented;
3. An evaluation of USGS digital 1 inch = 24,000 inches scale digital data be performed;
4. The automated update of digital FIRMS be tested;
5. The Map Information Facility concept be reviewed with regard to new Bureau of the Census digital data;
6. The applications of automated information systems to the Engineering Study Package be examined; and
7. The Federal Insurance Administration (FIA) create a steering committee to guide the application of GIS technology within the NFIP.

**Fragile Foundations: A Report on America's Public Works, National Council on Public Works Improvement. 1988.**

After two years of study, the National Council on Public Works Improvement has found convincing evidence that the quality of America's infrastructure (including highways, mass transit, aviation, water resources, water supply, and waste water, solid waste and hazardous waste disposal, as well as communications, energy facilities, schools, hospitals, prisons, and parks) is barely adequate to fulfill current requirements, and insufficient to meet the demands of future economic growth and development.

Therefore, the Council recommended a national commitment, shared by all levels of government, the private sector, and the public, to vastly improve America's infrastructure. Such a commitment could require an increase of up to 100 percent in the amount of capital the Nation invests each year in new and existing public works. In 1985, this amount was approximately \$45 billion.

A strategy to upgrade America's infrastructure must incorporate other tactics in addition to increased investment. Thus the Council also recommended:

1. Clarification of the respective roles of the Federal, State, and local governments in the construction and management of infrastructure to focus responsibility and increase accountability;
2. Steps to improve the performance and efficiency of existing facilities;
3. A rational capital budgeting process at all levels of Government;
4. Strong incentives to ensure adequate maintenance and, where appropriate, adopt new technologies; and
5. More rigorous and widespread use of low capital techniques for delivering services and meeting service needs, such as demand management, coordinated land-use planning, and waste reduction and recycling.

The Council recommended that state and local governments continue to play their traditional leadership roles in the construction and management of the Nation's infrastructure. But the Council also believed that the Federal Government must act as a full and responsible partner on a long-term basis in the national effort to increase and sustain public capital investment. The Council supported appropriate actions to redress the imbalance between consumption and savings so that future infrastructure commitments will not be shortchanged.

**Summary.** Considerable effort has been devoted to the management of land information, but limited progress has been made toward broad-scale coordination and of land information. A few of the recommendations in the studies cited in this chapter have been implemented; many have not.

For example, in reference to the recommendations in *Need for a Multipurpose Cadastre*, National Research Council (1980), the BLM is actively engaged in developing a Geographic Coordinate Data Base, that contains coordinates of the Public Land Survey System (PLSS) and relevant monuments. Digital cartographic standards are being addressed by the Federal Interagency Coordinating Committee on Digital Cartography. The Institute for Land Information has taken the role of designating Centers of Excellence in educational programs that deal with land information. The National Science Foundation and NASA are funding educational centers for mapping and geographic information analysis.

Although the National Research Council studies have provided guidance for developing LIS capabilities in some local governments, they have had little effect on the development of a nationwide network of consistent and comprehensive LISs among local governments.

While previous studies have identified the problem and have made suitable recommendations, a comprehensive, consistent network of land information systems allowing information to be easily transferred from one level of government to another has not emerged. There may be several reasons for this:

**Need for Leadership:** Several of the studies have stated that without Federal leadership, developments would be slow, disjointed, and of uneven quality. The Federal Government has provided leadership in the development of map accuracy standards and geodetic control standards. Digital cartographic standards are in progress and, to a limited extent, some Federal agencies have participated in the development of LISs at the local level of government. However, efforts to provide a coordination mechanism for all levels of government in developing policies, procedures, and standards for improving the management of land information have not been successful. In addition, suitable attention by local government associations was not forthcoming. There is a need for a focal point that would provide oversight for development of a comprehensive, consistent nationwide "network" of compatible land information for use by the Federal, State, and local levels of government as well as the private sector.

**Need for Authority:** While all studies presented suitable recommendations that were both needed and desired, there was no authority to implement the strategies that were suggested. Because the leadership role has not

been clearly identified, authority for undertaking action to systematically improve the management of land information throughout the Nation is lacking.

*Need for Broad-Based Commitment:* The costs of improving land information management must be justified from the start based on the multiple use of that information, for if a network of land information systems is to be cost-effective, it must serve a multitude of purposes. Even if an LIS is required to support a single purpose initially, the system must be capable of evolving into a multipurpose system when additional needs arise.

*Need for an Appropriate Skill-Mix:* The lack of personnel qualified to manage technical and some administrative aspects of land information systems has hampered the improvement of land information management. Resources of additional universities and private industry must be brought into play. Also of vital importance is the need to continue to update the skills of those already in the service of the Federal, State, and local levels of government.

*Need for a Focus for Funding:* Previous studies have shown that cost is often perceived as the primary obstacle of developing an LIS, particularly at the local level of government. Without adequate incentives, the development of human, technical, and data resources will be sporadic, and thus the total cost to the taxpayer will be higher. Traditionally, systematic and coordinated developments, such as the construction of canals, railroads, highways and airports, and the protection of civil rights and the environment, have occurred throughout the country only when the Federal Government has decided to act and has set up Federal

programs. Without Federal grants, the States are faced with a prospect of increasing taxes and the possibility of driving investments to other States without such taxes. Furthermore, Government agencies are usually funded for specific programs and for single-purpose activities. New approaches are required to address the cooperative funding of multipurpose programs.

*Need for an Institutional Framework:* In general, the roots of successful LIS initiatives are often traced to the actions of a few highly motivated individuals. Frequently, a system may have had only one champion. Problems have arisen when the lead individual has, for one reason or another, relinquished control. For a system to be a permanent feature, it must be independent of any individual. To succeed in the long-term, an LIS must be protected by switching the emphasis from the system technology to the institutional framework within which the system is to function. Most studies did not adequately address the question of institutional requirements; however, the National Research Council (1980), did recognize organizational and institutional requirements as the primary obstacles for the development of the multipurpose cadastre and proposed State and local government Offices of Land Information as a mechanism. Such offices ultimately may prove successful. At present, however, there is a perception that a more suitable mechanism is required in the short-term if progress is to be achieved. As noted by the National Research Council (1980), components of land information systems exist within the present government structure. The most successful ventures to date have been when there has been a concerted effort to develop a spirit of cooperation and understanding between and among agencies.



## Ongoing Activities

**Overview.** Ongoing LIS activities touch most government programs in the United States, and the private sector as well. Other countries are also developing comprehensive LISs. In this country, land information records and systems are maintained by 83,216 State and local governments (including towns, townships, municipalities, etc.), plus many agencies of the Federal Government. This information supports a variety of decisionmaking processes where the underlying interest is to manage the land more effectively and efficiently.

More than 80 percent of all data collected and maintained by State and local governments are land related or have geographic characteristics. There are few activities, especially at the local level, that do not require information by location. Examples of location-related activities include the delivery of protective and emergency services, decisionmaking related to utility transportation, education, and economic development services.

Examples of current LIS activities are cited to illustrate the breadth and depth of LIS. It is evident that the potential is limited not by technology, need, or inventiveness of government or private industry; but reflect, rather, a lack of institutionalized coordination of land information management. The use and the development of the new technology will proceed at an ever increasing pace; however, if leadership and coordination are added, mutual goals will be articulated and effort and money will be saved.

**Federal.** Federal governmental agencies are increasingly using advanced computer technology to aid in data collection, data dissemination, and decisionmaking where spatially oriented information is required. Within this technology base are various systems known as land information systems, digital cartographic systems, electronic mapping systems, and geographic information systems.

In addition to land management planning and allocation, these activities also include: (1) air traffic control; (2) new generations of weapons systems; (3) complex environmental analysis; and (4) compilation and organization of census information.

There are many agencies in the Federal Government that use land information. Within the Department of the Interior alone there are nine agencies - the Bureau of Land Management, the U.S. Geological Survey, the National Park Service, the Fish and Wildlife Service, the Bureau of Reclamation, the Bureau of Indian Affairs, the Minerals Management Service, the Bureau of Mines, and the Office of Surface Mining. Within the Department of Commerce there are three - the National Oceanic and Atmospheric Administration, the Bureau of the Census, and the National Institute of Standards and Technology. In the Department of Agriculture, there are nine: the U.S. Forest Service, the National Agricultural Statistics Service, the Agricultural Research Service, the Agricultural Stabilization and Conservation Service, the Animal and Plant Health Inspection Service, the Economic Research Service, the Soil Conservation Service, the Foreign Agricultural Service, and the World Agricultural Outlook Board.

A more complete list of Federal agencies and their programs and activities related to land information systems is included in Appendix B.

The components of geodetic control, topographic, and cadastral data which are necessary for all LIS activities are divided among four agencies. At least thirty-nine agencies maintain mapping capabilities, but these four are the sources for the data which are common to all maps and land information at the Federal level:

1. The National Mapping Program of the USGS provides geographic, cartographic, remote sensing information, digital cartographic data, and publishes general purpose maps.
2. The Public Land Survey Program of the BLM establishes and maintains physical corners of townships, sections and quarter sections. The BLM is responsible for Cadastral Surveying mineral lease boundaries, Indian and Trust lands, State and county cooperative surveys, and mapping and remote sensing data.
3. The national Geodetic Control Program of the National Oceanic and Atmospheric Administration (NOAA) establishes and maintains the National

Geodetic Reference System and publishes status maps of acceptable geodetic control. Since this is the primary Federal geodetic control program, the Director of the Office of Charting and Geodetic Services chairs the Federal Geodetic Control Committee, which coordinates the planning and execution of Federal geodetic surveys and related activities.

4. The Geometronics Service Center of the National Forest Service of the USDA performs civil surveying and mapping activities for the Forest Service.

Coordination of Federal surveying and mapping activities has been guided by the Office of Management and Budget (OMB) Circular A-16, dated May 6, 1967, covering the use of Federal funds that can contribute to the National Topographic Series and the National Networks of Geodetic Control. This circular has not been updated in more than 20 years; however, it is currently being reviewed and will be updated to reflect support for Federal coordination and leadership as well as an outreach program to State and local governments and the private sector. In addition, any update to Circular A-16 should determine whether a closer organizational structure would enhance coordination, and should also consider an identified linkage to State and local governments to solicit, prioritize, and coordinate their surveying and mapping needs.

In 1983, the OMB chartered a new group, the Federal Interagency Coordinating Committee on Digital Cartography (FICCDC) to "improve the use of digital cartographic base data within the Federal Government and to provide a framework for its proper management." The committee is chaired by the Department of the Interior.

The OMB stated in an October 1988 report that proposed expenditures for electronic mapping data base development alone will total \$760 million over the next four years; \$325 million will be spent by two programs in the DOI - the BLM's Automated Land and Mineral Record System (ALMRS) program -- \$97 million and the USGS's Digital Cartographic Data Base - \$228 million. The Department of Commerce's Geographic Support System - \$177 million, and the Department of Agriculture's Forest Service Geographic Information System - \$113 million, are also included in this total.

**State.** The driving force behind State land information responsibilities has been the need to link land information and geographic analysis to a variety of State decisionmaking contexts. With a few notable exceptions, State LIS activities can be characterized as highly diversified among multiple State Offices. The nature of State land information activities is evolving. Evidence of this can be seen in the focus and types of land information activities being constructed by the states during the last 10 to 15 years as compared with that of the 1960's. Reasons for these shifts include the changing nature of technology and the increasingly complex issues for which public policy decisions are made.

There are several States where the Governor and/or legislature has developed a strategy to organize and manage LIS activities on a broad basis and with a far-reaching perspective. In the cases where a multi-agency task force has examined land record modernization and coordination issues, recommendations have focused on a coordinated program, including a central office for LIS activities in the State. The majority of land information responsibilities undertaken by the States over the last 20 to 30 years have been generated from natural resource and environmental policy issues. The driving force has been the need to link land information and geographic analysis to state decisionmaking. These activities to a large extent have been based on individual agency mandates from both the Federal and State levels and specific agency user needs. With a few notable exceptions, State LIS activities can be characterized as diversified among a variety of state executive planning offices and line agencies. In the 1960's, natural resource information systems were financed with State general revenue funds. These efforts, coincident with the availability of mainframe computer technology, were attempts to create and maintain centralized databases and to provide clearinghouse capabilities. The intent was to facilitate end user access to a variety of land information databases available from different sources.

In the 1970's and 1980's, while individual agencies still tend to dominate State land information work, the trend in State efforts appears to be moving toward a focus on data development issues including establishing and enforcing standards and coordinating individual agency work. These developments are in part related to the advent of microcomputers which encourage decentralized database maintenance and the increasing understanding

that information becomes more valuable as the context in which it can be used is broadened.

The following information describing current State land information initiatives was gathered from a short questionnaire administered to a sample of twenty (20) States by the National Governors' Association. The States were selected to represent diverse geographic regions within the U.S., different state populations, size, and public land and non-public land states. This survey is representative of the States and gives a fair picture of State activities currently being planned and/or underway.

In each State a single contact was sought to participate in the study. In general, the agencies contacted represent functional and executive branch line agencies or the office of the interagency land information committee responsible for specific or generic land information activities. The survey questions, in some States, were distributed to multiple agencies and the responses coordinated by the prime contact person. The key informant technique was used to identify an appropriate contact person in each State.

Authority for State land information activities is derived from several bases - Federal legislation and regulations; and State executive and/or legislative branch mandates. In most States these authorities give a variety of State agencies the responsibility to conduct land information collection, processing, dissemination and/or use activities. Currently, only in a few cases is a lead agency or coordinating mechanism designated to oversee land information activities in their totality.

The trend seems to suggest a growing interest among a number of States to institute and fund a land information coordination role at the State level. Current State land information activities vary widely from State to State along a continuum. The continuum includes States where multiple agencies work with land records and information systems independently. Examples include *Tennessee*, *Oklahoma*, and *Nevada*.

At another point on the continuum are the States where an interagency committee/council mechanism is in place to either study the status of land information and make recommendations or to set policy and coordinate activities. Several examples of States in this category include *Georgia*, *Oregon*, and *Wisconsin*. In *Florida*, the Information Resource Commission has responsibility for land information activities. These States have an

Advisory Board that has been responsible for studying the land information issues that crosscut individual agency activities and recommending an action plan to the Governor and legislature. The Advisory Boards in these States generally have representation from State, local, and Federal levels of government, the private sector, academia, and professional associations. Board members generally have been appointed by the Governor for varying terms of office.

A third point on the continuum is represented by those States where there is a single office given responsibility for land information activities. These States include *North Carolina*, *Minnesota*, and *Vermont*. In *North Carolina*, the agency is located in the Department of Natural Resources and Community Development, Division of Land Resources. In *Minnesota* and *Vermont*, the responsibility is housed in the State Planning Agency.

Sources and levels of funding for land information activities vary greatly from State to State. Factors influencing funding tend to include State policy and budget priorities, level of information development and related activities, extent of technology integration, and agency coordination. Examples of funding mechanisms used and proposed for use in several States include:

In *Oregon*, the Governor, in 1987, combined the Oregon Land Information Advisory Committee and the State Map Advisory Committee in the State Map Advisory Council. The purpose of the council is to improve the quality, access and utility of Oregon's land information systems, and to link information and analytic resources to the policy needs of the agencies. The focus, organization, and membership of the Council is designed to synergize the entire spectrum of organizational coordination toward enhanced land information systems. Representatives from local governments, the private sector, universities, and State agencies make up the Council. The Council consists of an Executive Board and three committees--the Oregon Mapping Committee, the Oregon GIS Committee, and the Oregon Land Records Committee. Members of the Executive Board are appointed by the Governor to provide leadership in the translation of natural resource policy issues to LIS requirements.

The Council incorporates a recognition of the need for Federal, State, and local coordination at the policy level; the fragmented responsibility for natural resources among agencies in Oregon; the need to expand efforts in the area of local land records; and the need to focus

efforts into action using existing institutions and budgetary mechanisms. The Oregon Land Records Committee (OLRC) of the Council provides a forum for education and communications among professionals concerning the appropriate application of GIS concepts and technology to modernize land records and information at the local level. The OLRC has developed a recommended strategy to modernize land records in Oregon. It is a two-part program, one is a long-term process of creating powerful multipurpose land information systems, while the other is to develop in the short term, a geographic index that will serve immediate needs to integrate and access data by location. The OLRC recommends counties develop a County Geographic Index that uses the U.S. Bureau of the Census' TIGER File as a spatial framework. The County Geographic Index concept includes a program of rural addressing to extend street and road addresses county-wide. This capability is central to being able to integrate and locate records from separate data files. An important extension to the index is to include a Tract Index to the County Assessor's parcel data. It is proposed that this Tract Index be in the TIGER framework, and thus part of the County Geographic Index.

The second program recommendation is to carefully construct a foundation for multi-purpose land information systems (MPLIS). The MPLIS concept consists of spatially registered layers of institutionally independent data. Organizations remain in control over their data, as the responsible organization is best able to update and ensure the accuracy of the data. The data, or some derivative will be made available or shared, if the layers are spatially registered, which is dependent on accurate geodetic control. The OLRC also recommends that counties undertake a base mapping program and produce orthophotography. A legislative program to modernize Oregon's land records, which requires the creation of an Office of Land Records, is pending.

In *Georgia*, the 1988 General Assembly established a State Mapping and Land Records Modernization Advisory Board to systematically and effectively initiate land records modernization. The Board is assigned to the Department of Community Affairs for administrative purposes. It is comprised of 21 members, including a cross-section of State and local government, as well as professional association and private sector representation. The State Legislature will also participate as a means of providing direct oversight. While not yet fully operational, the Board, when properly staffed and

funded, should be able to provide adequate and timely technical assistance to local governments. Currently, the State is active in several areas, including: establishing a statewide GIS/LIS; coordinating the establishment of regional GISs, directly and indirectly coordinating local government activities; and establishing pilot projects.

At the regional level in *Georgia*, a number of Area Planning and Development Commissions are beginning to plan land information activity. At the local level, many counties are implementing or studying the implementation of LISs. In the private sector, a number of utilities are actively engaged in collecting land information related to their specific activities.

The State of *North Carolina* instituted a Land Records Management Program in 1977. The program has a full-time staff of eight persons, and in FY 1989-90, \$1,025,000 in matching grants were awarded to 60 counties. As of 1989, grants totalling \$4,260,000 have been awarded to 82 of the State's 100 counties for projects ranging from base maps, cadastral or property line maps, a system of parcel identifiers, and automation of land records. To date, a total of 76 counties in *North Carolina* have been mapped or are in the process of mapping. Thirty-one counties and three cities are using the base map data in an automated LIS. Four additional counties are expected to acquire systems in the next year. The program is also in the process of developing State-wide standards for the local register of deeds office in the State. When these standards are implemented, much of the State's parcel level land information will be collected, stored, and disseminated in a uniform manner.

In *Minnesota*, the Land Management Information Center (LMIC) is funded through user agency fees which make up between 60 percent and 70 percent of the Center's \$1.2 million budget. This level of revenue is considered to be one of the largest financial commitments to land information among the States. Approximately two thirds of these fees are paid by State agencies. One-quarter of the Center's clients represent the private sector. Only one-third of the Center's employees are funded through State general fund appropriations. The LMIC will do some cost sharing if the project involves significant research, but most users are charged full price.

**Local government** is the most active and most significant player in the LIS revolution because they manage land information at its most basic level. These efforts range from simple mapping projects to comprehensive LIS

systems which include every aspect of local government. The activity is at an almost fever pitch, but the foundation in policy and standards is most often missing. There are many projects which appear to be part of strong, organized land information programs, however, without coordination above the local government level, benefits and problems are not articulated so that others can learn and save time, energy, and money.

**County Activities.** The Nation's 3,042 counties all engage in land information activities that cover the entire spectrum of land information management from manual systems to the most sophisticated technologies. Several hundred other local governments also participate in the handling of land information. The National Association of Counties surveyed some 800 local governments regarding their land information systems. The responses indicate that there is relatively little uniformity in these systems, even within local systems. This report cannot attempt to describe all of the efforts underway to plan and develop land information systems in this country. To highlight the diversity and complexity of land information activities of local governments, a brief overview of some of these systems is presented.

Working through a grant and cooperative agreement from the National Geodetic Survey of the National Oceanic and Atmospheric Administration, three parishes in Louisiana (*Jefferson, Calcasieu, and Orleans*) are participating in pilot projects on implementation of the recommendations of the National Research Council (NRC) studies. These projects have included all of the major components outlined in the NRC reports. Using the Global Positioning System, satellite surveys have been conducted to densify the parishes' geodetic reference network; these points have been added to the National Geodetic Reference System (NGRS). Accurate large scale base mapping is provided from current aerial photography. Parcel maps showing boundaries are being developed. Land records are being verified and added to the data base.

A lead agency has been designated in each parish, responsible for coordinating the needs of all of the participating agencies and users. These projects are receiving 60 percent Federal funding (provided by Congress in the annual Commerce Department Appropriations Act) and are matched by 40 percent local funding.

In May 1984, the *County and City of San Diego* entered into a 10-year agreement to develop a "regional urban

information system." All major county departments involved in permit processing and land use matters participated in a thorough needs assessment before implementation of the program. The City of San Diego had already developed its city-wide system. The cost of this integrated program called "RUIS" is borne by the two jurisdictions.

It had long been recognized by the County and the city that improved staff productivity and better information for decisionmaking could be achieved through automation of land-related information. RUIS also provides a mechanism to coordinate and control the implementation of computer technology throughout the county departments. A total of 28 County and City departments are involved in the program. The centralized approach avoids duplicative and incompatible systems which have been developed in jurisdictions that have taken a departmental approach to geographic information management. It benefits the private sector and the general public through the creation of more uniform processes, as well as forms and procedures, both manual and automated. The seven phases of the RUIS work program are scheduled for completion in 1996.

The Computerized Appraisal Data and Mapping System project for *Franklin County (Ohio)* was launched in February 1987. The auditor has made a commitment to implement a county-wide geographic information system by 1992. One of the goals of this project was to develop and implement a digital data base containing graphic and non-graphic appraisal information captured on an accurate planimetric base mapping foundation. This effort will enhance the appraisal process by greatly increasing the auditor's information storage, retrieval, inventory and analysis capabilities, enabling the auditor's office to make more informed judgments that will help them move towards equalization taxation for the taxpayers of the county. This appraisal tool will change the way the county manages appraisal information and allow employees to spend more time using and analyzing this information and less time gathering it.

*Prince William County, Virginia*, is a good example of the diversity of land information systems at the local level and not atypical, so this county's processes and procedures are provided in some detail. In this midsize Virginia county, land deeds are filed with the Clerk of the Court office and they are microfilmed. A copy of the microfilm is given to the Real Estate Assessment Office where certain information is abstracted from the deed

and an Assessment record is maintained on a main frame computer for use by all county agencies or offices. Copies of deeds are received from the courthouse and changes due to completed transfers are entered in the parcel database. New parcels and subdivisions are compiled using coordinate geometry on an automated mapping system. Digital and mylar maps are updated weekly and new tax map numbers are assigned to the parcels. The county does not put anything on their property ownership maps that does not appear on a recorded land document. The reason for this is that the property maps are being used as the basis for a parcel specific data base which the county will be using to manage land related development. Most of the tabular attribute data associated with the land records is maintained by the County Assessment Office. But since the Assessment Office defines parcels in their own way for tax purposes there is not a one-to-one correspondence between the records in their database and the parcels on the property ownership maps. The development of the county's new LIS taxation module will deal with this since upon implementation there will be a single corporate database where no data elements are duplicated.

The *City of Baltimore, Maryland* has one of the nation's oldest land record systems and the Baltimore data are historically very extensive. The city now has a fully computer-based facility which allows users and administrators to have access by terminals to all the city's land records. The current system now covers more than 300 terminals attached to the city's main frame with access to land information. The system services the city's tax, assessment, ownership, housing, and rental information needs for a large number of departments and agencies. Because of the centralization, the systems can be immediately updated and the latest information made available to city departments and users.

*Minneapolis/Hennepin County, Minnesota* is one of the most promising areas in LIS development. The City of Minneapolis started to develop an integrated LIS in the 1970's and was joined by Hennepin County and together they have developed a fully integrated system. The system has been such a success that it has now become the model for three other contiguous counties. The surrounding counties of Ramsey, Dakota, and Washington are all in different stages of development in their systems but on completion, this unified system will be a great advantage for the residents of the region.

*Winston-Salem/Forsyth County, North Carolina* began dev-

elopment and implementation of a modern land records information system in the early 1970s. The city of Winston-Salem and the state legislature both shared in the start-up cost to develop the county pilot. The county wanted a system that would be for the benefit of all of its citizens. They wanted the ability to establish property values on the basis of current market data and to be able to assure residents that their taxes were being calculated according to the true value of their property. The system had to be able to respond to citizens who wished to subdivide their property, or ascertain their zoning or building restrictions, or maps showing the locations and dimensions of their property or any other information they might need that is essential to real estate transactions. The system was developed to satisfy the county's present needs but with a capacity of expansion to meet changes as they occur. Requirements were: *first*, geodetic control supplemented, as needed, by field survey points; *second*, aerial photography using a calibrated metric camera, flown to meet specific mapping accuracy requirements; *third*, analytical aerotriangulation to extend the geodetic control network with sufficient density and accuracy to fulfill map accuracy requirements; *fourth*, orthophoto base maps to meet the specified mapping requirements for such departments as planning and taxation and to satisfy the needs of the information system for very detailed visual presentation of ground information; *fifth*, highway network maps, which include the precise location of every street intersection and right-of-way centerline in the county, digitized from existing highway plans and railroad right-of-way maps; *sixth*, parcel maps which associate legal parcel dimensions and tax map descriptions with the orthophotography; *lastly*, the use of line verification to delete major graphic distortions caused by errors in existing deeds or tax maps by comparing computer drawn parcel boundaries with orthophoto maps. The structure of the data base will be some 160,000 parcels entered into the system when the project is completed. Forsyth county has made a significant investment in this pioneering effort and coordinated that effort with related State and Federal agencies. The State has been very supportive in assisting counties to develop these types of systems.

A study of *Louisville-Jefferson County, Kentucky* mapping and data needs and resources confirmed that city and County agencies and local utilities are mired in a mass of mapping data--base maps, parcel maps, subdivision maps, zoning maps, etc. Further study revealed that 26 governmental units and area utilities produce or modify

111 sets of maps at an annual cost of \$3.2 million. Of all 111 map sets, 59 are used by more than one organizational unit and 20 sets are used by more than five units. Parcels and subdivisions are routinely re-mapped at least six times by government and utilities, often at different scales and degrees of accuracy.

In total, area agencies maintain some 95 automated geographic databases and 110 manual databases. A wide divergence in types and capabilities of computers throughout agencies means that communication of data among agencies is complicated. Replacing current manual mapping practices with the automated system will produce savings of as much as \$5.7 million over a 10 year period. Conservative estimates indicate that staff efficiency will increase by at least a third with full implementation of the new system. Six organizations will no longer spend their resources producing the same parcel maps. One agency will map an area; the other five will have complete access to the information in digital form. The plan is to establish an active local partnership that will include the Metropolitan Sewer District, local government agencies and departments, community and regional units, Louisville and Jefferson County utilities and other users. The partnership arrangement will permit local government units with diverse responsibilities--ranging from land management to public safety --to have at their fingertips the most current geographic information available on Jefferson County.

The *County of Los Angeles, California* consists of some 40 departments and numerous committees, commissions, and special districts. It consists of 4,084 square miles of area from the ocean to the mountains, with four climatic types. Approximately 50 percent of county departmental information is related to geographical locations, via addresses, parcels, etc. The private sector and other public agencies also have a need for this same LIS information. These various agencies independently pursue their own information needs. This program is a result of the desire to share information, to reduce redundancy, reduce costs, increase service, as well as allow a greater range of capabilities.

A review of county-wide LIS information needs identified seven basic problems that are common to all departments that have the need to process geographically related information: (1) lack of structured communication regarding sources and availability of geographically related information; (2) lack of timely and convenient access to geographically related information; (3) geo-

graphic information is not always current and/or accurate; (4) due to the lack of a common map base, geographic information is duplicated and maintained independently by several departments/agencies; (5) maintaining existing geographically related information is extremely time consuming, difficult, and labor intensive; (6) limited correlation between graphic (map) and non-graphic (attribute) geographically related information; and (7) difficulty in combining existing mapped information due to the use of different scales, standards, accuracy levels, coordinate systems methodologies, etc.

Immediate objectives of the LIS program in the County of Los Angeles include: (1) coordinate multi-departmental LIS efforts; (2) develop, implement, manage and maintain a comprehensive long-range systems planning effort to administer a county-wide information system; (3) encourage department heads to become personally involved in reviewing existing systems and the long-range systems planning process as part of their goals; (4) establish policy, management and funding responsibilities to implement an integrated county-wide geographic system; (5) determine support requirements; (6) pursue legal changes to allow recovery of development costs and participation of the private sector; (7) encourage County departments and the private sector to commit to bridging their departmental geoprocessing capabilities to a county-wide LIS.

The management alternative selected for implementation recognizes State and Federal mandates and funding limitations. Consequently, the following four phase plan was developed: Phase I - Ratification of the system by departmental members; Phase II - Coordinate cooperative efforts on a continuous basis; Phase III - Structure development for program expansion on a continuous basis; Phase IV - Achieve and manage a county-wide LIS by a target date of 1997. Land information processing and automated mapping is currently being done within 24 departments of the County. Each department, special district, commission and committee incurs its own costs whether or not a joint effort is pursued. These separate operations have duplications, inefficiencies, incompatibilities, inconsistencies and costs which can be saved. Establishing a coordinated effort to share information, resources and development costs will serve common needs.

*Clark County, Nevada* growth has placed an increasing burden on the County government's performance of its functions. To cope with the expanding demand for

services, the County has increasingly employed computer systems to increase staff productivity. One of the areas in which computers offer significant improvements in productivity is the production and maintenance of maps and the processing of geographically related information. In 1980, the County commissioned a study that resulted in a conceptual design and implementation plan for a geographic information system (GIS).

The initial focus of this study was on those organizations within the County which regularly maintain and use standard map sets. This study began with an analysis of key County organizations and agencies which presently maintain map sets and which include: Public Works Department, Assessor's Office, Elections Department, Fire Department, Comprehensive Planning, Las Vegas Valley Water District, and the Sanitation District. Uses from reference to record keeping to analysis and planning were evaluated. A major focus of this analysis was an evaluation of which features could be combined into a centralized data bank and which uses could be accommodated with that centralized set.

Three levels of capacity were specified: (1) minimum automation, (2) moderate, and highly sophisticated, and (3) a centralized manual operation. Two alternate moderate level configurations were specified, one based on a mini computer and one on a mainframe type computer. Necessary support resources and data entry were also specified.

The findings of the cost benefit analysis indicate a strong potential for automation. The review of the present operations indicates that 89 persons in eight departments, offices, and districts in the County are employed full or part time in map activities. This results in an annual personnel cost of over \$650,000 and a total maintenance cost of \$683,000. Taking into consideration inflation and an increase in information requirements due to continued development in the County, the costs for the next five years will be an estimated \$5 million dollars, or an average annual cost of \$1,000,000 if the manual approach is continued. On the other hand, acquisition and use of a moderate level computer system by those eight organizations would reduce the five year cost to \$2,685,000, or an average of \$537,000 per year including acquisition in the first year and operation and maintenance for five years. This savings of \$2,280,000 or \$456,000 per year for an automated mapping approach indicates that automation is definitely more economical than continuing manual maintenance.

Automation of the type evaluated in this study has been undertaken by numerous cities and counties around the country. While this is a relatively new technology in local government, the indications from those who have employed it are quite positive. Productivity has improved and numerous benefits from the flexibility, standardization, and quality have been obtained. The computation and data handling capabilities of the automated system's computer have provided additional benefits.

*DuPage County, Illinois* is one example of a basic mapping project in which the county undertook a remonumentation and mapping project in 1980 and spent nearly \$2 million over seven years to customize a mapping system in their mainframe environment. They expect a \$400,000 annual savings and improved land information for all municipalities in the county through the use of a sophisticated telecommunications network.

*Wyandotte County, Kansas* is an example of a single purpose project that has triggered greater benefits. The county has developed a parcel level land records system over the past eleven years. The effort was initiated because of a poorly documented and inaccurate property tax roll. Many parcels were improperly assessed and missing from the tax roll entirely. Using Federal Revenue Sharing funds, the County was able to undertake a phased project to improve their cadastre. The County assumed full funding for the project which included 66,000 parcels in 1979. The project cost approximately \$1.2 million through 1984. In 1983, increased revenues from delinquent taxes identified by the system exceeded the total ten-year program budget. The system is now being used as the basis for other county activities such as tracking of voter precincts and other mapping activities.

*Orange County and the City of Orlando, Florida* is one of the largest, most comprehensive LIS projects in local government. It was undertaken in conjunction with the County Appraiser. Three government entities have committed \$10 million dollars over five years to create a digital base map tied to a rudimentary geodetic network. The digital base map supports and is supported by the daily operations of every government operation from the subdivision of land into transferable parcels, through the permitting of construction, to the delivery of services to occupants of new buildings. The Appraisers will be able to monitor all changes in property values on a daily basis using distributed processing



capabilities. The new system is essential for the enforcement of new state laws requiring the monitoring of development and the availability of basic services such as roads, water, sewer, and parks. There is also a strong infrastructure component which will allow the monitoring of the roads and pipelines from design through maintenance and replacement. The system design recognizes the essential link between the graphic and non-graphic components of land information and the fact that land information is a basic necessity for all government activity.

The *Indianapolis, Indiana* IMAGIS (Indianapolis Mapping and Geographic Infrastructure System) project began in late 1985 as a single-department project and has grown into a consortium with eight initial participants from both the private and public sectors. The consortium was initially bound by a "Memorandum of Understanding" and ultimately, by the "IMAGIS Service Agreement" between Indiana University and the eight participants. From its inception, the IMAGIS consortium was intended to produce a county-wide comprehensive land-related digital database that would serve as the AM element of an AM/FM (Automated Mapping/Facilities Management) Project. Six of the eight participants have started FM projects.

The IMAGIS project, from its inception, has always envisioned that FM applications would be the responsibility of each participant. Since the participants each will use the same land base, the information created from the collective FM programs will be compatible, at least on a geographic basis. This compatibility offers many opportunities for academic and sociological uses. Costs for creating the land base (AM) is approximately \$21 per land parcel with approximately 86% being conversion costs. The remaining 14% is for hardware and software needed to use the land base and does not include data communication and IMAGIS administrative costs. The FM program cost is approximately \$760 per mile of sanitary sewer or \$7.50 per customer served. Hardware and software costs are 24% of the total, and conversion costs are 75%. Much of the conversion cost is due to inadequate existing manual records. Approximately \$1.2 million in conversion costs could have been saved with adequate records.

**Rural county efforts.** Land information systems simultaneously serving real property taxation, land transfer, and land use planning functions in local government have been developed mostly in metropolitan areas. A

simplified scheme providing land information common to several offices in a rural county government is the Rappahannock County, Virginia Land Information System (RAPLI-II). It is based on a geographic identifier and three computerized land information files on ownership, transfers, and physical features of land. To test the technical and economic feasibility, an operational model system was built and compared to the concurrently functioning manual system. The system was technically feasible in the sense of generating legally required reports and economically feasible in the sense of reducing recordkeeping costs in local government.

The costs and benefits to the county government of RAPLI were the subject of a 1976 study that concluded that RAPLI-II is economically feasible on the strength of cost savings alone (that is, without any value attached to improved performance or additional capability). The return would be nearly 9 percent on the development costs for the entire system, even though the land use system adds much to cost and cannot account for financial savings because there is no ongoing procedure on which to save. If economic benefit were assigned to the land use subsystem, net savings to the county would cover development costs in 3 years. Procedures can be adapted to meet the needs of a particular local government, but the land information system, to be complete, must encompass assessment and taxation, conveyancing, and land use planning and regulation. Systems such as RAPLI-II should integrate data from all county offices through a common parcel identifier; incorporate the functions, files, and reports of all county offices; simplify the system so that it is understood and used by personnel in all offices; prevent increases in public expenditures; and maintain flexibility for expanding and adapting to new demands for information.

After programs are written and procedures are developed, costs for additional computer work are minimal. The cooperation that is the heart of a RAPLI-II type system within the county is the key to successful record keeping among counties. This experiment indicates that small counties can improve their present information system with minimal change in procedures with a net savings in resources and with substantial room for growth and improvement. Many larger systems have been designed to solve volume problems and, as such, their procedures, techniques, and equipment call for specialization, speed, and space reduction. RAPLI-II stresses simplicity and flexibility; it is understandable and usable by all county employees.

Private industry and organizations are taking advantage of the opportunities presented by the overwhelming demand for LIS. Existing companies are adopting new technologies and new companies are developing around the evolving needs. Industry is compelled to move ahead even without national models or standards.

Private *surveying and mapping firms* play a significant role in the evolution of an integrated LIS. The necessary densification of geodetic control is often undertaken by private surveying firms, coordinates are "run in" to establish locational ties for medium and large scale municipal, commercial, and private projects. Property line surveys identify the relative or absolute position of individual parcels, buildings, infrastructures and appurtenances. A parcel based LIS presumes adequate location of property lines and extent of ownership. This information may be unreliable if a Licensed/Registered Surveyor is not involved with the creation of the cadastral data. Just as an attorney maintains a title file, private surveyors retain research records gathered in doing background investigations prior to beginning field surveys. These research records contain accumulated information which is parcel based, and are an excellent source of data for an LIS.

Private surveyors act as advocates for parcel based systems at the local level, since they are among the primary generators of LIS data. Additionally, private surveyors and photogrammetrists are becoming increasingly involved with the creation of base maps for local governments. Surveyors understand the legal requirements of land information and their work must be capable of sustaining review and adjudication by a court of competent jurisdiction.

The greatest percentage of funds presently being spent in this country on LIS implementation involves *data conversion*. The term conversion refers to the transformation of analog data from paper or mylar maps into digital form. It is a very specialized undertaking and requires editing and integrating existing source maps. The process has not been standardized and there is no one accepted model that can be used by any local government in the procurement of such services.

Private *photogrammetry firms* have for decades provided base maps for local government and, with the advent of computer technology, these firms now offer clients turnkey LIS services either through in-house capabilities or through associations with surveyors and other firms.

These companies have been in the forefront of LIS data collection and conversion research, developing powerful capabilities which support this new field. There are more than 250 professional photogrammetric mapping firms in the United States. Most have, as a minimum, a digital mapping capability. Others can offer extensive LIS services from primary data collection to serving as consultants, service bureaus, managers of government owned/contractor operated facilities, as well as data collection and management contractors. Among these services are: aerial photography and digital satellite imagery, aerial photo processing, surveying (cadastral, geodetic, facilities inventory, engineering, hydrographic, and others), analytical aerial triangulation, conventional photogrammetric mapping, orthophotography, digital mapping and digital data acquisition, digital terrain modeling, graphic and attribute data base compilation, data conversion, and data base development and management. Many of the leading firms have formed relationships with other organizations to provide financing for LIS development.

In the *hardware/software vendor* community, LIS is emerging as a major market segment of the computer industry. At least four types of vendors can be identified: hardware suppliers, software suppliers, system integrators, and service companies. Some companies are involved in more than one of these categories. In general, vendors strive to provide goods and/or services to automate existing LIS workflows. The LIS market exhibits steady growth which continues to attract new vendors. The compound annual growth rate for the past five years has been between 25-30 percent, with similar rates projected for the next five years. In 1990, the market is expected to exceed \$1 billion for hardware and software alone, and these represent only 20 percent of LIS costs.

*Utilities* (usually gas, electric and telephone) have numerous functions that require land information and they are important collectors, maintainers and users of land information. Many utilities have developed complex and sophisticated land information systems to respond to needs for efficient management of their facilities, responsive service to their customers, and compliance with Public Utilities Commission regulations. The land information activities of a utility can be classified into four general areas; facility management, property accounting, customer billing, and real estate management. They maintain information on real property rights including ownership and easements; location and characteristics of generation, transmission, land distribution

facilities; and customer accounts. Utilities have tended to operate independently in maintaining land information, though much of their data can be shared with other utilities and local governments. Utilities have been focusing their land information activities for the past five years on automated mapping/facilities management (AM/FM) technology, developing sophisticated systems and extensive data bases covering the land base and facilities of their service areas. This AM/FM field will continue to be the major utility land information focus for the foreseeable future. Estimates of the current and anticipated AM/FM investments run into billions of dollars. Publicly held utilities are also involved in this technology.

**Natural resource management** was one of the first areas to use LIS technology. LIS currently is used by resource scientists for a wide variety of applications such as mineral extraction, wildlife habitat identification and management, timber harvest planning, snow melt runoff prediction, and monitoring of coastal erosion. Private and government organizations have been using LIS for more than a decade to manage their land-based natural resources. Activities in resource management can be divided into two areas: renewable resources (forest products, wildlife, etc.), and non-renewable (oil, gas, and wetlands, etc.). The LIS technology being adopted by each area overlaps in terms of base mapping and property records management, but differs in terms of scientific disciplines. Therefore, application software designed and used by one area will not automatically satisfy the other. For example, the oil and gas industry requires some unique capabilities for managing geophysical (seismic), petrophysical (well log), and geological (lithology) data in an integrated fashion. This requires different data models and algorithms than are typical of other industries, such as forest products. However, the basic land data is the same as that used by the local government in whose jurisdiction the land parcels are located. The standardization of land records would improve the ties among all disciplines and industries.

**Infrastructure management** is primarily a public responsibility. However, there is a large private industry which support the entire life cycle of public works from the engineering planning stage, through construction and maintenance, to eventual planning for replacement. There is currently nearly \$3 trillion dollars of existing infrastructure in the United States. This infrastructure includes roads, bridges, ports, water and waste-water systems, mass transit, and airports. In constant 1982

dollars, Federal spending for non-defense infrastructure is expected to increase to \$15 billion in 1990, up \$9.1 billion from 1980 levels. In order to manage this infrastructure, the industry is developing automated management systems based on LIS technology and data because these public works are all land based, i.e., location is the primary reference for the physical plant, be it a pipe, a road, a rail, a dock, or a terminal. As the National Council of Public Works Improvement concluded, "...there is convincing evidence that the quality of America's infrastructure is barely adequate to fulfill current requirements and insufficient to meet the demand of future economic growth and development." Proper planning and management of the infrastructure requires adequate inventories of public works. The Council on Public Works Improvement states: "The Council strongly encourages all levels of government to upgrade the quality and quantity of basic public works management information in order to measure and improve system performance." At present, too many infrastructure investment decision in America are made by "the seat of the pants." Small and medium-sized jurisdictions (and many large ones too) do not have complete inventories of existing facilities; most do not conduct regular surveys of the condition of public facilities or collect information on the quality, quantity, or cost of services."

The absence of leadership in the LIS industry has prompted professional societies and associations to action. These organizations of professionals from all elements of the industry—private and public—are grappling with the broad interdisciplinary nature of the issues. They have begun to face the challenge by joining forces to examine the roles of each profession in supporting the industry and the people it serves. The activities include national and international conferences and seminars that are forums for new ideas, educational programs for members, and initiatives to encourage educational opportunities in colleges and universities that support the LIS interdisciplinary need. These organizations reflect the expansive growth in the LIS area in the mushrooming attendance at conferences and seminars that deal with the subject. A joint conference sponsored by four major professional groups held in 1988 attracted more than 3,000 people, double the 1987 attendance and half the expected attendance for 1989. The need is driving the industry. **Leadership is needed to coordinate the progress being made.** Adequate inventories must locate the components of the infrastructure and link them to the land and jurisdictions they

serve. LIS technology is the only feasible management tool for this growing inventory of \$3 trillion of pipes, valves, highways, bridges, runways, rail switches, and intersections. The FM Automation Newsletter estimated in 1986 that the market for infrastructure management systems and services will be \$90.6 billion by the year 2000. If everyone uses different data, in different formats, with different standards for describing the land, the inventory will be piecemeal and chaotic; the monies spent on data development will be misspent and the safety and well-being of citizens compromised.

**International Activities.** The importance of land information management has been recognized around the world. Most governments have the same requirements to monitor and manage land information within their jurisdiction. For example, in *Canada*, the Federal and Provincial levels of government are taking responsibility for the basic mapping and data collection standards that support the more detailed LIS activities of local governments. Responsibility for topographic mapping in Canada is shared by three levels of government. The Federal Government is responsible for small scale mapping (1:50,000 and smaller); the Provinces are responsible for medium scales (1:10,000 to 1:20,000); and local governments map at the largest scales (larger than 1:2000). The higher levels of government have been instrumental in the development of the essential mapping at all levels. They have accomplished this through the selection of standards, implementation of education programs for government and the private sector to encourage the use of standards, and the granting of seed monies to initiate projects that use the standards and serve as pilot projects to test the standards and LIS concepts.

The *Province of Ontario* encouraged the adoption and use of standards by the private surveying and mapping industry by funding 50 percent of qualifying projects for two years. It did this to build LIS capabilities of private industry. This initiative led to the establishment of a consortium of government and private groups that furthered the development of standards and specifications for high quality, accurate topographic and land ownership data bases. This expertise at the provincial level is being translated into municipalities throughout Ontario. Costs for projects are shared by

Federal, Provincial, municipal and private industries, including utilities. The Director of the Geographic Information Systems Division in the Department of Energy, Mines and Resources in Ottawa has said that perhaps the greatest benefit of LIS is that it has provided a mechanism for cooperation across governmental boundaries and with the private sector.

*France* has outlined a 30-year plan to automate all mapping functions throughout the country by the year 2019. The French County of Herault has joined with the IGN (Institut Geographique National) to become the first county in France to begin development of a computerized land information system. Eventually, independent organizations such as utilities and railroads will join the project development.

Other countries have also recognized the need for a coordinated approach to a national problem; given that the issue is bigger than any one unit of government, be it Federal or municipal. Land information modernization is taking place in both highly industrialized nations and in third world countries. Some of the countries involved in establishing LISs include *West Germany, Japan, India, China, Australia, Sweden*, as well as countries in *Africa* and *South America*. The World Bank is currently preparing a report entitled "Land Management Information for Urban Development: Needs, Issues, and Options" which deals extensively with LIS development, use, and advantages.

**Summary.** The management of land information is developing into one of the largest industries in the United States. There are few activities, especially at the local government level, that do not require information by location in order to function properly. Ongoing LIS activities are driving the development of a major new technology. Private industry is responding to the billions of dollars required to build and implement this technology. However, there is an urgent need for State and Federal government leadership to guide and coordinate the growth of LIS activities, and to improve the management of land information resources. The overriding concern is to provide for the intelligent management of the land. The solution is the better management of the information about the land.

## COORDINATION

**Overview.** A multipurpose LIS is complex to implement because its success depends on bringing together in an integrated network a wide range of information including earth sciences, environmental and natural resources, infrastructure, real property, legal descriptions, and socio-economics. Perhaps the most important complexity is the political structure under which the LIS is destined to operate in the United States. While land ownership information is maintained in many countries at the national level, such a restructuring in the United States would be politically impossible, even though it may be the most efficient way to support all needs for land information.

A more feasible concept provides for operating a network of land information systems at county/municipal, State and Federal levels. This network would be operated with Federal and State support and guidance, under standards that will assure ties to approved geodetic reference points and data quality that will permit full and efficient exchange of the information to meet the needs of all potential users. Achieving coordination is the most important concern in establishing a multipurpose LIS. Focal points established at each governmental level and in key organizations in the private sector would assure this coordination.

### Roles/Responsibilities

**County/Local.** Maintaining land title records is a function of county governments (or their equivalents) in the U.S., except in some New England states where it is a function of city and town governments. Municipalities, counties and, in some cases, special districts are developing land information systems, but like all levels of government, at a much slower rate than the growth of technological capabilities. Local governments have a long and complex development time line to be organizationally able to build land information systems and inter-organizational resources and systems. They also have greater information, capital, and human resource needs than the Federal and State sectors. As noted previously in this report, the content of land records is more related to functions of local government than to those of State or Federal agencies. For any given parcel of privately-owned land, data are more likely to be already on file in

the local property assessment, county surveyor, municipal engineer, building department, and recorder's offices to support current functions than to be on file in State or Federal offices. Local governments manage the greatest amount of land information at the parcel level, and provide the largest number of services to the public, such as those involving public utilities and public safety. They rely on land information for many needs, not the least of which is land zoning and property taxation. In addition, special districts provide services such as utilities, schools, and fire protection, and exist for specific geographical areas. LISs are being developed and managed by these districts and by other such entities.

County and local governments serve as the primary citizen access point, and also provide information to meet Federal and State agency needs for local land information programs. The investments being made by local governments every year in extending and updating their files on land parcels are substantial. However, the file contents seldom are maintained in a form adequate for Federal projects or for merging with data from neighboring areas in a regionwide or statewide analysis. Nevertheless, the files of local government agencies define the state-of-the-land records in most areas, and it is necessary to build upon them in a national program rather than to duplicate them.

Since the content of land records is closely related to functions of local government, local agencies may assume larger shares of responsibility for the components that depend on unique local activities; i.e., the larger-scale cadastral maps, the land parcel register, and the land parcel data files. It is at this level of government, close to the individual citizen and to the individual parcel of land, that combinations of human and technical resources are needed, including organizing procedures that result in the collection, storage, retrieval, dissemination, and use of land data in a systematic way.

A framework that supports continuous, readily available, and comprehensive land-related information at the parcel level should be local in nature in order to meet the particular demands of citizens and officials close to the making or implementation of decisions about parcels of land. A local LIS necessarily reflects factors that

consider the needs of other jurisdictions, including Federal and State Governments and the private sector. Such a system provides the means to transmit land information "to and from" the other levels of government and the private sector.

It will be up to each local government to organize and maintain the files for its own land area within that framework, and to take maximum advantage of them for the planning and administration of local programs. Local governments will continue to be the operating agencies, the providers of this public service, when an LIS network is in place.

**States.** The State role in land information activities is emerging as a key link in the highly decentralized intergovernmental system of this country. At the State level, land information activity resembles both Federal and local levels organizationally, being highly diversified across numerous agencies and disciplines. The distinguishing factor at the State level is that the maintenance of land ownership records is not the driving force that it is at the local level. The States, however, create and define the legal and operating environment in which local governments operate, where the primary responsibility for land record maintenance rests. A key responsibility of the States is to coordinate the collection and maintenance of data elements by State and local agencies as well as the use of standards terms and procedures. Through these and other actions, a state can manage land information activities.

It is becoming increasingly clear that a substantive State role is critically needed to maximize the cost efficiency and consistency of basic land records and systems.

Variations across States are extensive in specific land information activities, their mandates, the underlying decisionmaking needs and policy purposes, the administrative configurations, State/local relationships, the authority vested in the various State agencies, and the financing mechanisms available. For this reason, generalizations made from State-specific examples are limited. However, it is fair to characterize the general State role in the past as more supportive of a viable Federal role than dependent upon the State's own capabilities to build and coordinate a land information network. This appears to be due to the heavy influence of Federal activities directly on the local level (standards, definitions, and methodologies).

As early as the late 1960s, however, some States, using their own funds, attempted to build strong, centralized land information capabilities to maintain common data bases, primarily in the natural resources area. Today, a wide variety of data users in some of these States are reaping the benefits as they apply the resulting integrated information to a variety of State policy and individual decisions.

Many States recently have been reexamining and enhancing their role due to several influences. At the Federal level, these factors include shifts in governmental responsibility, budget cuts in related information activities and programmatic areas, minimal encouragement of inter-agency information coordination, and a diluted role in information resource management activities. In addition, recommendations from the National Research Council's studies, cited earlier in this report, may also have encouraged increased State activity. Other external factors include the increasing amount of local expenditures in LIS and the large number of incompatible products.

Internal factors including the recent growth in and changing nature of State program responsibilities, coupled with the reality of fiscal limitations, have generated increased pressure for more comprehensive, compatible, and reliable land information. As the competition for scarce resources among different policy areas and programs becomes particularly acute, the Governor and other key State officials require high quality information on State, sub-State, and regional jurisdictions to make informed decisions and to identify critical future issues. The State's businesses and citizens need land information to make informed social, economic, and geographic choices.

Regional partnerships with an increased focus on sharing land information are also emerging as technology makes this a reality. The States and selected localities have been acquiring new technology and rapidly automating complex information systems to keep current. This growth in technology comes with an associated growth in costs, duplication, inefficiencies, and incompatibilities among existing State, Federal and local data systems. The result is stress on States' ability to synthesize or consolidate information from a variety of sources as a rational basis for policy making. While increasing emphasis on State information resource management has begun to address these issues, work in functional areas

such as land information becomes all the more important. These influences have crystallized the need for more formal State involvement in land information activities from policy, operational, and technological perspectives. The essential role of each State government is envisioned to be that of the provider of a complete range of "systems functions" or development and coordination activities that can best be carried out at the State level and enable the local provision of quality land information-related services to citizens and the private sector. Functions of the States, in cooperation with local entities--the maintainers of land records--could include the responsibility to:

1. Maintain Federal/State relations (liaison) and facilitate intergovernmental information sharing;
2. Coordinate land information activities among State agencies;
3. Administer funds (Federal/State) to local governments and/or allocate resources among State agencies;
4. Strategically plan the development of land information systems to meet multiple user needs;
5. Provide oversight for technical, data definition, and procedural standards;
6. Oversee/monitor funded State and local activities;
7. Conduct research/evaluations;
8. Provide training/technical assistance and qualify/certify personnel;
9. Report data including local data aggregations to Federal programs;
10. Disseminate land information to multiple-users.

A more formal State commitment to land information coordination will assure a wide variety of State and local data users that land information is produced more efficiently, is more easily accessible to all user groups, and is more readily understandable and suitable for diverse applications. Decisions of State governments will set the trends for the development of current and future land information systems in each State. Emerging State activities, however, can operate successfully only if the

common State needs--such as Federal interagency coordination, leadership, maintenance of Federal land records, data collection, and assistance on multi-State issues--are addressed adequately at the Federal level.

**Federal Government.** Without Federal coordination, there appears to be little chance of compatibility among the land records systems of the individual States. Likewise, individual county and municipal land information is likely to become compatible only where the Federal Government or other coordinating body issues standards and procedures. The status of cadastral records today confirms this point. At the opposite extreme are the systems for which the Federal Government has set high standards for quality and frequency of reporting of local conditions as a prerequisite for receiving Federal funds. Incentives of this type--for example, in fields such as water pollution control, hospital administration, and education--have caused local administrators to respond rapidly to modernize and standardize their data systems.

A number of Federal agencies are also developing automated information systems, including land information systems for Federal lands they manage, or to meet responsibilities to manage programs that require land-related information. These agencies, including major land managing agencies in the Departments of the Interior and Agriculture, are a source of expertise for other levels of government. These agencies are developing national and regional data bases that contain information of great value to State and local governments, and can serve as models for State and local LIS efforts. As stated in Chapter V (Ongoing Activities), coordination of Federal surveying and mapping activities has been guided by the OMB Circular A-16. This Circular, which was last revised in 1967, is currently being reviewed and will be updated to reflect support for Federal coordination and leadership as well as an outreach program to State and local governments and the private sector. The most important Federal role in development of a national LIS could be characterized as providing leadership and support in:

1. Research and technical standards;
2. Coordination and support to States in seeking ways to better use available funding;
3. Use and support of the local records by Federal agencies whose operations relate to the land;

4. Setting an example of excellence in organizing and maintaining Federal land records;
5. Guidance and training.

Additionally, the Federal Government should:

1. Identify Federal requirements for land information data and provide the coordination and collection priorities to assist in ensuring that needs are met;
2. Provide a mechanism for the development and review of land information data standards within the Federal sector that will facilitate data interchange and avoid or minimize the costs of conversions and incompatibilities;
3. Facilitate the economic and efficient application of land information systems through the sharing of experiences and applications;
4. Serve as a forum for the exchange of information and ideas on technology and on methods for collecting, managing, and using land information; and
5. Monitor technology and identify areas in need of further research and development.

**Private.** The private sector plays a dual role as builder and user of land information systems. The private sector can make a valuable contribution in the development of an LIS data base, as well as in the maintenance of parcel maps and attribute data. Private firms have made significant investments in equipment, personnel, and training. As a result, their capabilities are extensive and varied. The private sector is the principal developer of new hardware and software to support LIS activities. As it responds to the periodic needs of different governmental agencies for basic land information such as surveys and other data collection activities, private industry is maintaining expertise that is valuable to most governments. Private LIS development performed by utilities and environmental engineering firms is also an excellent source of data that can serve infrastructure management needs of government. The private/public sector relationship should be symbiotic; however, this requires coordination that can come only if there is a national policy or program to give structure to development and use of the technology. A large part of this symbiotic relationship should be evident in a strong

LIS education program through professional associations. The development of college curricula that support the interdisciplinary needs of LIS is needed to provide an educated work force for an expanding LIS industry.

**Summary.** Land information is the responsibility of numerous government agencies and is a valuable resource to all levels of government and to many in the private sector. Many of these organizations are developing their own land information systems and can define their own roles very specifically. The problem of coordination has been one of establishing a mechanism to deal with organizations at different levels of government having different missions and that have not had a need to coordinate in the past. **Federal and State agencies should assume a larger share of responsibility for the components of land information systems involving common data sources, standards, and multi-State integration.**

There are many cases when one organization is unaware of land data another organization may already have or is planning to collect. Often data classification systems are not compatible between user agencies, thereby resulting in a perceived need for duplicate coverage. Information is often gathered at the national or State level; but at the county, municipal, or town levels, the prevalent opinion is that State and Federal land information is too general or inappropriate in scale and resolution to be useful for local decisionmaking. **Ideally, there should be a national plan for the aggregation of land information that is collected locally to meet local requirements.** New LIS technology can provide the tools by which data about land can be integrated to address complex problems at the Federal, State, and local levels. There are at least four areas in which coordination should be improved.

*First*, Federal agencies should develop a coordinated land information management process.

*Second*, it is also essential that State responsibility in land information coordination and management be defined and implemented. This process should accommodate the needs, schedules, and data resolution requirements of State and local governments as well as the private sector.

*Third*, Federal and State agencies should pay closer attention to data being generated and used by county and local governments as well as the private sector. Much of these data are of higher resolution than needed at the



State or national level, but with modern LIS technology, these data can be generalized to provide a more efficient information source than can be obtained from original collection processes.

*Fourth*, coordination mechanisms should be put in place to continually revise and update land information. Land information is seldom static, and its value deteriorates with age.

While there has been considerable progress in improving the quality of land information systems, both in geodetic reference use and in data servicing, there has been much less progress in bringing this huge effort into a coordinated network to address the total national requirement.

Until this is accomplished, the growing expenditure of the national wealth on such systems will not provide the uniform high-quality integrated land information data base critical to the management of national development and resources.

The most significant action that can be taken at all levels of government is to provide a focal point for the coordination of land information activities and programs. This focal point for coordination should be responsible for addressing issues and opportunities that cross the boundaries between agencies, jurisdictions, and disciplines. If LIS needs and requirements are to be articulated so that users can benefit from the technology, a program must be designed to meet these goals.

While coordination responsibilities might differ in detail at each level of government, the coordinating bodies should:

1. Serve as the focal point for LIS activities within the specific level of government. This might be done with a committee composed of representatives of every agency responsible for land information within that level of government, including agencies that map, manage, and/or use land information. The purpose of the committee would be to develop and manage LIS policy and programs;
2. Serve as liaison with other levels of government and the private sector;
3. Develop and implement an LIS education program for government agencies and the private sector;
4. Review land projects and programs to identify those that are related to LIS, and facilitate the development of those projects so that they support the LIS policy and programs;
5. Identify land-related budget items and review them for possible benefits or savings that might be gained by coordination with overlapping projects or the LIS development as a whole.

State LIS coordination responsibilities might encompass more detail. It may be necessary to provide technical assistance and incentives to the local level to promote LIS activities.

Local government coordination is involved in the most detailed activities because it is at this level that the most detailed land information is collected and maintained. The role at this level is to help in the development of specific systems that support a comprehensive LIS and mapping program.



## GUIDELINES/STANDARDS

**Overview.** In the early days of the computer industry, companies that supplied information technology generally favored a proprietary philosophy. They had the idea that their systems could operate completely independently. However, as technology has developed, there has been a move to adopt common standards. Information will be stored and managed as separate (physical and logical) sets; nevertheless, there normally are needs to exchange and share data among the multiple organizations. Since a multipurpose land information system won't operate under a single control, there is need for standards to allow the exchange and sharing of the data between and among organizations.

For the purposes of this report, a standard is defined as a specification, test method, definition, classification, or practice that has been approved by the sponsoring group and adopted in accordance with the procedures established within the appropriate laws, regulations, directives or technical society (definition adapted from National Institute of Standards and Technology). Standardization requirements encompass functional, performance, and interface aspects for any system. To exchange land related information effectively from one system to another, an efficient mechanism is needed that will allow the use of the data without losing or altering the information. To satisfy this requirement, an exchange standard should provide a means for recording information on data quality, for retaining all topological information, and for classifying the features and their attributes present in the data. An exchange standard should be flexible, easy to use, complete, and unambiguous. In addition the data should include an index so that the user can identify an original data set.

The goal of developing and implementing standards is to provide compatibility across multiple levels of users, both public and private. One way to describe this compatibility is "systems integration," which provides a framework for fitting subcomponents of a single system to others, integrating different applications programs and operating systems, and developing and installing standards or "open systems." The standard should also address the human definition and interpretation, and the physical measurement of land data. Several standards already exist and can be incorporated into the land

information system structure of standards; these are described in the following section. The land information standards should build on these existing standards rather than replace them. Modifications and additions may be necessary to adapt them to specific LIS requirements, but many areas are already covered. The standards should achieve acceptance across organizational and professional boundaries, many of which place real or perceived constraints on the process.

The standards should be specified carefully to support the varied interests, perspectives, and requirements of the individual organizations, each of which has different functional roles regarding land information. The developers of standards can anticipate difficulties in attempting to serve these multiple interests.

These multiple interests require data at varying levels of accuracy even within an organization. For example, capital improvements planning does not use measurements of pipeline locations or detailed property dimensions, but engineers and work crews in the same agency do use them. A Federal or State soils scientist does not use property identifiers and detailed property lines when identifying valuable or unstable soils; however, when the coal government must appraise the land or pass laws governing the use of the unstable soils, the property lines and ownership are essential.

There are many levels of an LIS that involve different amounts of effort and money. Decisions on the content of an LIS are being made every day, but there are currently no objective models that describe the data alternatives available to local, State, or Federal governmental agencies, and that link those alternatives to the needs or requirements they would serve. Standards definitions of the data components of an LIS that specify the levels of data content, accuracy, and quality needed to meet specific requirements would provide a guide for decisionmakers and a basis for comparing systems between levels of government and nationwide for data sharing.

**What is Being Done?** Numerous accuracy standards have been proposed and others implemented in the United States. These pertain to the framework of the

multipurpose cadastre; namely, the geodetic reference system and the base mapping standards for the United States. Standards of accuracy for the geodetic reference system (geodetic control) and specifications to support these standards have been enacted by the Federal Geodetic Control Committee (FGCC). These standards evaluate control surveys based on three criteria: geometric strength of figure; instrumentation; and data reduction. It is only by fulfilling the standards within each criterion that a survey can be categorized by classification as first-, second-, or third-order. The FGCC is also developing a guidebook on multipurpose land information systems.

In addition to the standards for conventional terrestrial surveying listed by the FGCC, specifications and standards have been presented for photogrammetric control by Slama (1983) and for the Global Positioning System by the FGCC (1988). Standards for mapping have been in existence for more than 40 years. The United States National Map Accuracy Standards (NMAS) divide the standards into horizontal and vertical components. Horizontal accuracy is further broken down by the scale of the map--whether the scale is larger or smaller than 1:20,000. The standards are based on a 90 percent level of certainty that the plotted position of a point on a map is within the specified radius when compared to the actual ground position of the same point scaled on the map.

There are a number of weaknesses with the NMAS. One of critical concern to the development of a cadastral system and an LIS is that these standards were developed primarily for the national mapping program where the 1:24,000 (7.5' x 7.5') quadrangles are considered to be large scale. It is for this reason that both the American Society of Civil Engineers (ASCE) and the American Society for Photogrammetry and Remote Sensing (ASPRS) have developed large-scale map accuracy standards. The ASCE developed what is called Engineering Map Accuracy Standards (EMAS) as an alternative to the large-scale portion of the NMAS. The EMAS was developed to provide greater flexibility in producing maps for engineering and associated purposes, while preserving an unambiguous standard of accuracy, and using more generally understood error terminology at the full scale of the mapped feature. The standards developed by the ASPRS for photogrammetric mapping were similar. After considerable debate, a consensus was presented that defines the standard in terms of the root mean square error.

Cadastral surveying standards are not uniform throughout the U.S. It is the responsibility of the individual states to promulgate standards for surveying within their state. An informal survey done in 1987 showed that 33 States require property ownership maps, and 37 States require or recommend parcel identification systems. While six States use State plane coordinates as geographic reference, most States use only the legal reference systems, such as the Public Land Survey System. The American Congress on Surveying and Mapping (ACSM) and the American Land Title Association (ALTA) have developed minimum standards for land title surveys. These are similar to those developed by the FGCC in that surveys are based on class (here classes are based on land use). Each class is subsequently divided into different criteria involving geometry, instrumentation, and data reduction, although not to the detail exhibited in the FGCC specifications. **The Public Land Survey System** provides the legal basis for all land parcel descriptions which were created out of the Public Lands in 30 of the 50 States in this country. It covers nearly all lands, whether they are now Federal, State, local or private. All private land titles in the public land States have their basis in the Public Land Survey System and are identified by land parcel. **The Manual of Surveying Instructions**, published by the Department of the Interior's BLM, describes how cadastral surveys of the public lands are made in conformance to statutory law and its judicial interpretation.

The Department of the Interior's USGS has been designated by the National Institute of Standards and Technology as the key government agency for establishing data standards for Federal earth sciences. Earth sciences are those scientific disciplines concerned with the material and morphology of the earth and the physical forces related to the earth. These disciplines include geology, geography, cartography, and hydrology. Within these disciplines are uniquely named and defined categories called data elements. A data element is described by its name, its definition, and the format for representation of its values.

A proposed standard for digital spatial data has been developed through the efforts of three groups: The National Committee for Digital Cartographic Data Standards, the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography and the Digital Cartographic Data Standards Task Force. The goal of this standard is to

facilitate the general purpose use of digital spatial data bases by providing capabilities that make it easier to exchange and use data bases that were developed by other organizations. The work has been divided into four major components: define cartographic objects, develop a spatial data exchange mechanism, develop data quality specifications, and develop a unified set of cartographic feature definitions.

The work on the objects develops a unified set of primitive and simple objects that can be built up as digital representations of real-world features. The work on spatial data exchange aims to facilitate the digital transfer of the major kinds of cartographic and geographic data between currently noncommunicating computer systems without loss of content or meaning. The work on data quality develops the specifications for a quality report based on the concept of "truth in labeling" and recommends a coordinate standard. The work on cartographic features aims to specify a unified set of definitions for cartographic entities that preserve the real-world realizations of the feature and its associated attributes.

A Standard on Cadastral Maps and Parcel Identification has been published by the International Association of Assessing Officers. The standard provides recommendations on the development and maintenance of cadastral maps and parcel identifiers. It describes the components of a basic mapping system and addresses map content, design, preparation, materials, security, maintenance, and contracting for mapping services. It also discusses requirements for an effective parcel identification system as a common index to all property records.

**Summary.** To date, work on standards has been fragmented. For example, there are no standards for legal accuracy of deed descriptions that are filed, or even for a requirement that they be filed. Standards should be designed to allow and promote innovation and development, not to hinder such progress. In the long-term, comprehensive standards may not be possible in all instances, nor are they necessarily desirable, because of

rapid changes in technology. For example, standards for interfacing between computer systems have promoted advances. The standards developed should be integrated into a parcel-based LIS model that can be applied to publicly and privately-owned land. Maintenance and evolution of standards require a process and organizational structure.

There is a need for standard definitions of the data components of an LIS that specify content, quality, and accuracy so that the compatibility of data can be judged for data sharing, and so that decisionmakers have an objective basis for deciding what level of data is most appropriate for the purposes of an LIS within their budgetary constraints. There may be a need to designate an organization to maintain standards, such as the role currently played by the National Institute of Standards and Technology for some existing standards.

According to a recent informal survey, States support several general principles in standard development and implementation. These include:

- Standards must be practical and implementable;
- Standards should be based on benefits to both the custodial agency and the external user agencies and organizations;
- Funds should be available in proportion to the costs imposed by standards;
- Standards should be implemented in incremental or progressive stages;
- Standards development should be a cooperative effort among the relevant agencies/organizations.

An appropriate State level function is maintenance of standards, and provision of technical assistance to support standard implementation. State funding of local LIS activities should be tied to the use of a set of standards.

**Elements to be Considered for Standardization  
to Assist in Data Sharing\***

**Data Input and Encoding**

- Terminology and definitions
- Data capture (manual or automatic digitizing)
- Data validation and editing (quality checking)
- Data storage and structuring (construction of link/node topology, chain coding, etc.)
- Data attributes (accuracy, reliability, and content)

**Data Manipulation**

- Structure conversion (vector to raster, quadtrees to vector)
- Geometric conversion
- Generalization and classification
- Enhancement
- Abstraction

**Data Retrieval**

- Selective retrieval of information based on spatial or thematic criteria, including "browse" facilities

**Data Analysis**

- Spatial analysis
- Statistical analysis
- Measurement (of lines, areas, volumes, distance, direction)

**Database Management**

- Support and monitoring multi-user access to the databases
- Provision of back-up facilities for use in the event of system failure
- Organization of the database for efficient storage and retrieval without data redundancy
- Automatic maintenance of database security and integrity

\*The consideration of elements for standardization is not limited to those listed in this table.

## Benefit/Cost Analysis

**Overview.** Costs and benefits play a major role in program decisions. Benefit/cost analysis has been the major means of justifying new systems or improvements to existing ones. In land information management, however, neither the costs nor benefits are well understood. There is a need for research on costs and benefits relating to both the implementation and the maintenance of land information system. Of concern is not only the issue of identifying what the benefits are, but also who will receive them and when. Potential benefits are often indirect and difficult to quantify. They may not be realized for years or even generations and are thus heavily discounted, except when institutional arrangements are affected.

The Office of Management and budget estimated that obligations for Federal information technology reached \$17 billion in 1989 and accounted for 1.6 percent of the Federal budget. While this figure represents all areas of information technology, not just those for spatial data, these levels do represent a continuing commitment to prudent investment in modern technology in a period of constrained resources. These figures, however, do not reveal the real changes that have gone on in the Federal information technology world during the 1980s.

While the proportion of the information technology budget spent to purchase hardware has fallen to 17 percent, computer power per dollar spent continues to grow by about a factor of ten every six years, therefore, money spent for hardware today delivers far more computing power than it did a decade ago.

During the same period, the proportion of the information technology budget spent on commercial services has grown from about one-third to nearly one-half. Agencies are turning to the commercial sector for a wide range of support, from computer operations and programming to the growing area of total system integration and turn-key systems. In looking at the use of information technology by the Federal Government, two trends emerge:

*First*, the amount of computing power used by the government, and therefore its dependence on that technology, will continue to grow. It is difficult to

conceive of running large governmental systems like Social Security, the decennial census, military logistics, weather forecasting, tax collection, air traffic control, or land information systems, without modern information technology. The expectation is that public demand for these services, and improved responsiveness from them, will continue to grow, especially if a rational system, interlinked between Federal agencies and using a common data format compatible with the participating agencies' missions, is designed from the onset.

*Second*, the nature of governmental programs, not just the tools to operate them, will continue to change. Technology offers the potential not only to make systems more efficient and responsive, but to change fundamentally the way users of technology do business. For example, modern computers made it possible to reduce the backlog of earnings postings in the Social Security system and to issue nearly 40 million checks each month. More significantly, computers are making it possible for the Social Security system to operate like other insurance systems and give contributors estimates of expected benefits.

These trends will continue to accelerate. By the year 2000, most of the Federal Government's information-based activities will be done using automated data processing equipment. Moreover, because the private sector will be using this technology extensively, most interactions between the business communities and the government will occur electronically. Individual citizens also will have access to telecommunications devices and, therefore, to public databases.

**What is a benefit/cost analysis?** The basic aim of any benefit/cost analysis is to determine if benefits exceed costs. If so, the use of scarce resources in the program is consistent with the social goal of economic efficiency. To perform a benefit/cost analysis properly, it is necessary to understand and estimate the underlying supply and demand curves of the proposed LIS products. Supply is the actual LIS production level; demand is the theoretical maximum quantity of product that would be consumed. Total supply of the products consists of three components: (1) continued production of existing products, (2) production of more of the original products,

and (3) production of new products (some of which cannot be anticipated). It should be noted that the benefits of LIS products may include both quantifiable (tangible) and non-quantifiable (intangible) components (*Dickinson and Calkins*).

Usually, the LIS implementation provides enough data-handling capacity to substantially increase the supply of existing products. Additionally, products that previously were not feasible can be produced, in most instances, fairly easily. The problem arises in efforts to estimate the increased supply of old products and the production levels for newly defined products. Requirements studies identify a preliminary set of LIS products and provide an initial estimate of expected production levels. However, it is thought that the estimates for identified products are low and that, lacking experience with an LIS, many new products are not identified by the potential users of the systems. If systems users cannot adequately identify products and/or anticipate the future supply (this has yet to be verified by monitoring LIS use), then the supply would be more a function of automated data handling capacities than of product cost.

The basic benefit/cost analysis model includes three assumptions: (1) the system products can be defined, (2) these products have economic value, and (3) this economic value can be measured. However, situations exist where these assumptions are not met, as described below:

- The objectives of the system cannot be expressed entirely as products, such as when a system is used to improve a decisionmaking process. The objectives of implementing the system frequently are stated as improving the decisionmaking process, reducing uncertainty, or reducing risk. The products are faster responses to the ad hoc queries of decisionmakers and a higher percentage of "good" decisions. Hence, the outcome of the implementation is better performance as a result of better decisionmaking.
- The economic value of one or more products cannot be measured. Many products from an LIS are inputs to a subsequent larger process with its own product(s). The measurable value is valid only for the final product of the larger process. When a product (or entire system) is an input, a mechanism is needed to allocate the economic value of the final product back to the individual inputs.

- Implementation of the system affects the cost of existing products. The benefits of implementing the system many times are cost savings within the existing system (i.e., reducing the cost of production at a fixed level of output). Here, benefits are expressed as cost reductions or increased performance.

**Benefit/Cost Ratio.** The result of the benefit/cost analysis is the benefit/cost ratio. If this ratio is greater than one (1), the system is justified economically. This assumes that a benefit/cost ratio of 1:1 or higher is acceptable. The relationship between benefits and costs over time needed to justify an LIS should demonstrate that the benefits begin to accrue in the out-year periods as products begin to result from use of the system. Before this, only costs of activities arising from the LIS implementation are incurred.

Information is an investment, an essential ingredient for decisionmaking, and a means for better management of tangible resources. The value of information often is determined more by when it is available than by the costs of making it available, or even by its content. It generally is agreed that information has value in the marketplace and is perceived as a capital resource. Because the characteristics of information are inherently different from those of traditional capital expenditures, present benefit/cost methods make the measurement of benefits derived from information difficult, if not possible.

The core of the constraint is the uncertainty associated with quantifying the benefits of multiple-use; i.e., how can one quantify the direct value and the even greater indirect value of good land records for the separate but related activities of tens of thousands of government agencies as well as of those in the private sector? Can we effectively measure the effort not expended on searching for missing or inaccurate information, or the benefit gained by decisionmakers through the use of more comprehensive and accurate data. How can we measure benefits that accrue to agencies that range from the Department of the Interior to the local planning office?

**Alternate Approaches.** Two components are suggested to supplement the benefit/cost analysis for implementation of an LIS. These are a cost/performance evaluation and an estimated value of those benefits that are nonquantifiable under the basic benefit/cost model.



The class of benefits previously labeled "cost-savings" can be represented in a cost/performance model (or cost-effectiveness model). A cost/performance model would compare a given level of performance, probably measured in some non-monetary manner such as number of products, to the cost of achieving that performance. The savings in costs within the cost/performance model are benefits of the LIS, but are different from the added benefits achieved from implementation of the LIS. Therefore, calculations of these benefits should not be combined with the traditional benefit/cost analysis but should be reported separately using a cost/performance model. The second component addresses the question of how to represent the nonquantifiable benefits. These intangible benefits can be represented easily in descriptive form, but this does not provide much information other than to identify the broad class(es) of benefits. This is usually found in implementations where the objectives of the LIS are stated as (1) improved decisionmaking processes, (2) the reduction of risk, and/or (3) the reduction of uncertainty. Here, the output of the LIS is an input to the decisionmaking process that has its own objectives and products.

Two concepts from economics may be applicable to assist in estimating the nonquantifiable benefits: the economics of risk and the concept of derived demand. The economic concepts associated with determination of production levels deal with the risk or uncertainty involved in overproduction or underproduction (*Blair and Kenny, 1982*). It may be possible to create an analogous structure to apply the risk/uncertainty evaluation to the decisionmaking uses of an LIS. Knowledge of the frequency with which decisionmakers use an LIS could lead to the application of this concept.

The suggested interim approach is to attempt to identify an economic value for the result of the decisionmaking process and to apply a factor to that value to determine the benefit of the LIS. This could be a two-stage process: (1) estimation of the effect of better decisionmaking (i.e., how much value would be added to the result of the decisionmaking process from better decisionmaking), and (2) estimation of the contribution of the LIS to better decisionmaking. This assumes that the result of the decisionmaking can be assigned an economic value. Attempts to place a value on LIS activities using this approach can give some idea of the potential benefits. However, estimates of this kind usually produce very large values relative to the benefit/cost analysis or the cost/performance calculation.

It is suggested that benefits calculated in this manner be reported separately. This benefit would be expressed in terms of an order-of-magnitude estimate based on the value of projects, levels of spending in a government program, or some other related economic value.

**Specific Benefits of Coordinated LIS Network.** A more formal commitment to land information coordination will assure a wide variety of data users at all levels of government and in the private sector that land information is produced more efficiently, is more easily accessible to all user groups, and is more readily understandable and suitable for diverse applications. A review of previous research studies as well as ongoing activities listed in Chapter V provide a summary of the benefits to be gained from achieving a coordinated network of land information systems:

1. High-quality data and proper data organization will enable users to relate data in an LIS to other information about the land.
2. A coordinated approach at all levels will improve the quality, access, and utility of the LIS, and will link information and analytic resources to the policy needs of the agencies.
3. A coordinated LIS approach will avoid duplication of efforts and the proliferation of incompatible systems.
4. At the local level, a coordinated approach will enhance the appraisal process by greatly increasing the capabilities available to the officials responsible for information storage, retrieval, inventory, and analysis, enabling that official to make more informed judgments and thus move towards more equitable taxation within the level of government affected. One example of how this would become evident at the local level is through the greater likelihood that property subject to ad valorem taxation will be assessed on the basis of market value.
5. Coordination of automated activities at the local and State levels will facilitate the updating of the LIS to ensure that the latest information is available to the various users.
6. Many of the local land information systems described in Chapter V predict specific tangible benefits in both dollars and staff efficiency.

7. Local land information systems enhance the enforcement of State laws requiring the monitoring of development and the availability of basic services such as roads, water, sewer, and parks.
8. Coordination will enhance efficient planning and management of the Nation's infrastructure.

**Benefits for Federal and State Governments.** During the budget process for FY 1989, the Office of Management and Budget requested that the Bureau of Indian Affairs (BIA) prepare and submit a cost/benefit study of GIS in support of their budget request. A direct cost comparison between the two alternatives produced a combined ratio of total manual costs to GIS costs of 1.68:1. For the individual offices, the range was from 1:1 to 3.09:1. The higher the usage level at a site, the higher the ratio. The conclusion of the report stated, "the economic analyses clearly indicate that the GIS is a more cost effective and beneficial technology for producing the geographic information and analyses required by the BIA."

**New York State Department of Natural Resources:** Use of a GIS is saving the State approximately \$7 an acre yearly in developing timber contracts. It was found that the management and planning staff had a 10 percent increase in productivity.

**South Florida Regional Council:** A 1976 study estimated annual savings when using GIS of \$20,000 a year (1976 dollars).

**Carolina Power and Light (CP&L):** CP&L estimates that use of their GIS produces annual savings of approximately \$250,000 in contract preparation and right-of-way maintenance. Time studies indicate that there is a staff productivity increase of 5 to 10 percent through use of a GIS.

**Benefits to Local Governments.** Many local governments are attempting to improve their land records and land information management practices. For example, the *City of Indianapolis* spent in excess of \$10 per parcel to build an infrastructure information system; *Forsyth County, North Carolina* has spent in excess of \$25 per parcel to develop a comprehensive LIS that includes sophisticated information on each of the 125,000 parcels under its jurisdiction.

Other examples of benefit/cost studies at the local level include: In 1987, the *City of Little Rock, Arkansas*

conducted an evaluation of cost savings that could be obtained by implementing an LIS. They concluded that the amortization or payback period from an LIS usually ranged from between five to seven years, with a projected rate of return of approximately 30 percent. In general, time required to produce maps and map-related products were reduced by approximately 50 percent, with planning and engineering departments showing time reductions of approximately 20 percent. Regarding income revenue, the study cited *Los Angeles County, California* and its ability to offset 30 percent of its map production costs from the sale of LIS information.

The *City of Minneapolis, Minnesota* began automation of its engineering department in 1973. In 1976, *Hennepin County* joined with the city to form a joint city/county LIS program. The costs to support this effort for 15 years (1973-1988) was \$2,495,000. This included the purchase of computer hardware, software development, data processing, and digitizing aerial photography. The tangible benefits received from the LIS program included decreased personnel costs, reimbursement for work performed over and above regular work, and reimbursement from the sale of cadastral land base maps. These cost reductions amounted to \$24,800,000, which is a benefit/cost ratio of approximately 9.9:1.

**Barrow County,** a small urbanizing county in *Georgia*, evaluated the potential cost saving that could be projected from the implementation of an LIS as compared to the cost associated with the traditional manual method of tax re-evaluation. The Barrow County study indicated that the costs for a seven-year tax re-evaluation program using traditional manual methods was estimated to be \$1,969,840. The cost for a seven-year tax re-evaluation program, using a modernized, automated system was estimated to be \$620,000, an anticipated saving to Barrow County of approximately \$1,349,840, or 68.5 percent. Based on the projected cost savings, the county should be able to amortize the equipment and software development expenditures within two years. The estimated benefit/cost ratio was approximately 3.2:1 after five to seven years.

There are many areas of county responsibility that could benefit from an automated LIS. One example is a county's trash collection system. If, for instance, it could be shown that county collection dumpsters could be placed more appropriately and the collection schedule could be altered, the county may have the potential for eliminating one trash collection vehicle and its three-

person crew. If this is possible in an average size county, then the system has paid for itself in its first year of operation.

County governments, as well as the public and private sector, are always interested in improving emergency medical services. Many county governments have installed 911 emergency response systems. If 911 systems can be tied into the location of the caller, the rapid response of the emergency medical service personnel can be assured. An LIS can enhance the possibility of saving lives. An LIS can be used in the very sensitive area of selection and management of waste disposal sites. The system can be queried to show the potential sites that meet the criteria required for a waste disposal site; the sites can be displayed on the computer screen and plotted to show their location.

If geological and hydrological data are available and can be related to the overlying land parcel data, it, too, can be considered. By having information available about all potential sites, management can make an intelligent decision regarding the site or sites that best serve the majority of interests. The same process can be used regarding the locations of schools and other public facilities. School bus routing provides another source of potential savings. By knowing the location of all students, and their ages and grade levels, the land information managers, with the aid of an LIS, can select the optimum route plan for the county. With the selection of the most efficient routing system, there is a potential of substantial savings if the county can reduce the number of school buses required to transport the children to their assigned schools.

Industrial development is another area of importance to local government and the private sector. New industry generally means more jobs and the prospect of increased tax revenues to the county.

An LIS can be used to show the potential industrial sites that would satisfy the requirements of an industry looking to locate within the county. Such things as the location of water, sewer, and electrical lines and service can be shown in relation to a potential site and may influence an industry's decision to locate in the area.

Accurate, current, and reliable information integrated into an effective automated LIS also decreases the time that it takes the private sector to obtain land information. With automated systems, counties have the

ability to offer the land information to the private sector via telephonic hook-ups to the county's computerized data base. Anytime the public or private sector can acquire the information that it desires, and does not need assistance from the county staff, the need for additional personnel to meet the demands for service is eliminated or reduced. Alternatively, additional work loads can be accepted without the addition of more people.

**Federal Involvement in Electronic Data Bases.** Federal and State involvement in the development of land and geographic data bases is continuing to grow. This involvement will help ensure the necessary coordination of all levels of government and the private sector.

Recent surveys of non-defense Federal activities in electronic mapping and geographic information systems project that for fiscal years 1988-92:

- Total on-line data base size is expected to grow to 375 billion characters;
- Proposed expenditures for electronic mapping data base development (not including National Security expenditures) will grow to \$760 million;
- Approximately 80 percent of these expenditures for FYs 88-92 are proposed in: (1) the Department of the Interior's National Digital Cartographic Data Base at the USGS (\$228 million); (2) the Department of Commerce's Geographic Support System (\$177 million); (3) the Department of Agriculture's Forest Service Geographic Information System (\$113 million) and the Soil Conservation Service's Soil Databases (\$40 million); and (4) the Department of the Interior's Automated Land and Minerals Record System for BLM (\$97 million).

**Summary.** Performing an economic evaluation of implementing an LIS is a necessary but difficult task. The methods used must establish that the benefits are of sufficient magnitude to justify actual implementation for the LIS. The question of combining the components of the analysis can be answered only on a case-by-case basis. If most of the benefits can be quantified, then a composite benefit figure is reasonable.

The cost of implementing computer-based land information systems have focused attention on how costs associated with collecting, processing, and distributing

digital information should be recovered. The main concern is with establishing a price for the information or product, but there are many related issues.

Traditionally, most public goods have been provided at a token price. Government reports, for example, have been marketed at a price well below their true cost of production. As cost recovery becomes more important within government and large investments are made in computerized information, pricing has become a concern. Strategies for setting prices should cover production and handling costs, user demand and willingness to pay, and competition with other producers. A uniform approach does not exist for the economic evaluation of implementing an LIS. A clear understanding of what consti-

tutes a benefit, its associated economic value, and an appropriate measure for that value is essential. Often, decisionmakers focus solely on the results of the benefit/cost analysis because it is quantified. Ironically, most tangible benefits are identified but not included in actual benefit/cost models. As previously discussed, the potential benefits from some of the intangible items are quite large (i.e., better analysis, planning, and decisions). In situations where the intangible benefits cannot be defined further, a benefit/cost analysis is most likely to underestimate significantly the benefits to users. To broaden the evaluation of a land information program, a procedure is needed to incorporate the tangible cost savings and the real but non-quantifiable benefits into the final economic evaluation.

## Recommendations

**Overview.** This study has provided an excellent opportunity for a review of activities relating to the development of land information activities in the United States. Such a review was recommended by the Office of Management and Budget (OMB), in its October 1988 report, "A Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government." The report stated that it is "timely to review these planned actions and consider new policy or direction that will increase the effectiveness of the investments." The report also stated that "it is clear that additional coordination on the scope and content of existing electronic map information can result in significant savings."

Based on a review of previous study recommendations and ongoing activities at all levels of government as well as the private sector, the Section 8(b) study team found that there is no overall organizational responsibility for the coordination of land information systems in this country. Therefore, there is a need for a focal point that would provide oversight for development of a comprehensive, consistent, nationwide network of compatible land information for use by the Federal, State, and local levels of government as well as the private sector.

While information is often gathered at the national or State level, the prevalent opinion at the county, municipal, or town levels is that State and Federal land information is too general or inappropriate in scale and resolution to be useful for decisionmaking. Therefore, there should be a national strategy for the aggregation of land information that is collected locally to meet local requirements. New LIS technology can provide the tools by which data about land can be integrated to address complex problems at the Federal, State, and local levels.

Federal and State agencies should assume a larger share of responsibility for the components of land information systems involving common data sources, standards, and multi-State integration.

Recommendations to fulfill and support the needs identified in this study are made in five general areas: (1) land information network concept; (2) coordination; (3) guidelines/standards; (4) funding; and (5) education.

### 1. Land Information Network Concept.

To provide a framework for establishing a common approach to land information management, there must be a unified LIS concept. **Therefore, compatible land information systems should be developed at the local, State and Federal levels of government in cooperation with the private sector.** These systems should be structured on common components, use existing data sources when possible, and be linked through a common coordinate system. The data should be organized so they can be linked and accessible on the basis of parcel information as well as location information and can therefore be related to data in adjoining jurisdictions.

**1-A. The concept of a nationwide integrated land information management system should be adopted.**

**1-B. The components that all land information systems should contain are:**

- Geodetic control in the form of geographical or rectangular coordinates;
- Basic map information, including roads, hydrography, and cultural features;
- Property boundaries, including a unique identifier for land parcels;
- Land attributes, including legal rights, and land use information as needed by the particular jurisdiction.

### 2. Coordination

Land information is the responsibility of numerous government agencies and is a valuable resource to all levels of government and to many in the private sector. Many of these organizations are developing their own land information systems and can define their own roles very specifically. However, if LIS needs and requirements are to be articulated so that society can benefit from new technology, there must be a focal point that would be responsible for following through on issues and opportunities that cross the jurisdictional and institutional boundaries between agencies, departments,

jurisdictions, and disciplines. The most significant action that can be taken is to provide for coordination. An entity should be established that would provide leadership and coordination, as well as an impetus for all levels of government and the private sector to develop a commitment to the land information system concept. There are at least four areas in which coordination should be improved:

*First*, Federal agencies should continue to develop a coordinated land information management process.

*Second*, It is essential that State responsibility be defined and implemented to ensure land information coordination and management. This process should accommodate the needs, schedules, and data resolution requirements of State and local governments as well as the private sector.

*Third*, Federal and State agencies should pay closer attention to data being generated and used by county and local governments as well as the private sector. Many of these data are of higher resolution than needed at the State or national level but with modern LIS technology, these data can be generalized to provide a more efficient information source than can be obtained from separate original collection processes.

*Fourth*, coordination mechanisms should be put in place to continually revise and update land information. Land information is seldom static, and its value deteriorates with age.

The Section 8(b) study team considered several alternatives that would provide coordination for LIS activities at all levels of government including a national LIS commission and a single Federal agency with responsibilities for surveying, mapping and land information. The study team believes that active coordination of surveying, mapping, and land information functions is the most practical approach to ensure an effective nationwide program. This coordination can be achieved under existing authorities. Therefore, the Department of the Interior will take action to ensure that coordination activities will continue.

**2-A. Circular A-16, Coordination of Surveying and Mapping Activities**, which was last revised in 1967, is currently being reviewed and will be updated to reflect support for Federal coordination and leadership as well as an outreach program to State and local governments and the private sector.

**2-B. Responsibility for the coordination of LIS activities should be assigned to an individual organization at State and local levels of government.**

At the state and local levels, the organization could be either an existing agency or a commission created specifically for this purpose. This focal point would be charged with overseeing LIS activities within that State and would further the efforts to attain a system of linked land information systems within that State's boundaries, consistent with national-level goals.

**2-C. A process should be established for providing technical assistance to State and local governments.**

State and local levels of government have identified a need for assistance in the establishment and maintenance of appropriate LISs.

### **3. Guidelines/Standards.**

Land information systems must provide for maximum data exchangeability. Certain standards and guidelines must be implemented to provide needed compatibility, since the systems will not operate under a single control. Numerous standards have been proposed and others implemented in the United States. The development and implementation of guidelines and standards will help ensure that the land information systems of different levels of government, or of different agencies of one level of government, are indeed compatible.

**3-A. Current activities should continue regarding standards that relate to all aspects of an LIS. Particular emphasis should be placed on:**

- adoption of and adherence to already established standards;
- development and implementation of data exchange standards;
- identification of areas that need new standards.

**3-B. A commonly understood data model should be developed that would establish logical relationships among land entities (parcels, subdivisions, etc.).**

**3-C. LIS guidelines should be established that include data quality and accuracy.**

**3-D. Standard definitions should be developed for the data components of an LIS that specify content, quality, and accuracy so that the compatibility of data can be judged for data sharing, and so that decisionmakers have an objective basis for deciding what level of data is most appropriate for the purposes of an LIS within their budgetary constraints.**

#### **4. Funding.**

Coordinated land information systems will be less costly than systems developed independently at all levels of government; therefore, a funding strategy must be developed to ensure the successful, timely implementation of compatible land information systems at all levels of government. Such a strategy would provide a mechanism to encourage involvement at all levels of government and the private sector and to more effectively channel expenditures that are already occurring.

**4-A. A funding strategy should address: (1) existing sources of funding and current expenditures in government and in the private sector; (2) funding of the LIS coordination organizations; and (3) the importance of sharing data between government agencies and the private sector, such as utilities.**

Consideration could also be given to basing user fees (for land information data) on the value of the data. Currently, many governmental agencies charge users for the cost of the paper that contains the information, rather than for the value of the information itself. This service could range from copying a page from a plat book to computer generated maps that contain detailed resource information. There is a wide disparity in the cost of obtaining and/or producing this information, yet the per page cost to the user is often the same.

#### **5. Education**

Land information systems are complex, interacting with all aspects of society. They will have a wide range of potential impacts, many of which may not presently be identified. Applied research on managerial, institutional, economic, legal, and technical issues will be required. There is also a vital need for managers and users of land information to be knowledgeable if the information is to be used effectively in decisionmaking.

An active process of continuing education for Federal, State, and local government officials and private sector individuals working in land information related professions should be established and supported by the private sector, government agencies, professional associations, and academic institutions. The educational effort would provide programs for professionals and others involved in the management of land information. It would be geared to take advantage of regularly scheduled professional association meetings, but also would have components targeted for professors and academicians.

**5-A. In order to improve the overall knowledge and capabilities of LIS personnel, a procedure should be developed for personnel exchanges across all levels of government, the private sector, and geographic regions. Models should be developed for an ongoing training program for State, local, and private sector practitioners.**

**5-B. A mechanism should be established for continuing curriculum development to foster long-term orientations to land information management. Doing so would provide for a wide variety of media for training delivery to reach the vast number of individuals working in land information related professions.**





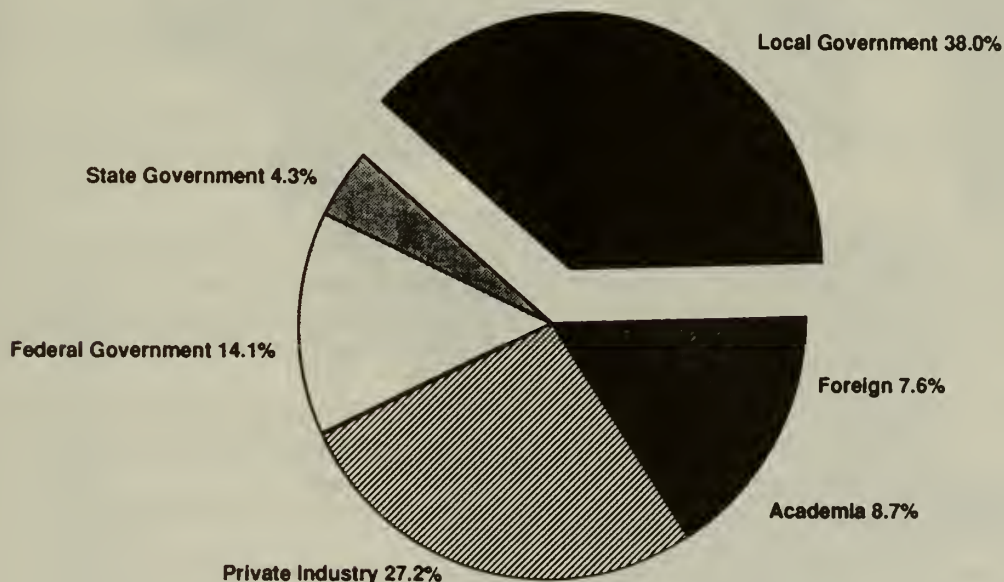
## PUBLIC COMMENTS

One of the strengths of this study is the cooperation and consultation that was accomplished through the efforts of the Section 8(b) study team. This consultation was extended to others with the distribution of the draft report to members of the public for their review. More than 3,500 copies of the initial draft of the Executive Summary were distributed at the national convention of the National Association of Counties held in Cincinnati, Ohio in July 1989. An additional 700 copies of the full report were mailed to others interested and concerned with the management of land information.

More than 100 letters were received during the three-week comment period. These comments were from 31 States in all parts of the country. (See Figure 6) In addition, nine comments were received from reviewers in foreign countries (Canada-4, Australia-3, Mexico, and West Germany). Approximately one-third of the respondents were from local government;

twenty-five percent represented the private sector; twenty percent were from Federal Government. The remaining respondents were split between State Government, academia, and foreign countries. (See Figure 5)

Many of the suggestions were incorporated into the report of the study team to the Secretary. Other comments identified issues that were not addressed by the study team or represent a point of view that may not be reflected in the report. For example, several people suggested the inclusion of offshore (marine) lands in any discussion of a comprehensive land information system; some were concerned about the maintenance of the systems. While this study did not address every issue identified by the public, the letters do provide a perspective that may be of interest to all who review the final report. The comments will also be helpful to future considerations of these topics. Therefore, all the letters are included as Appendix F.



Total Comments — 107

Figure 5. Land Information Study  
Source of Comments

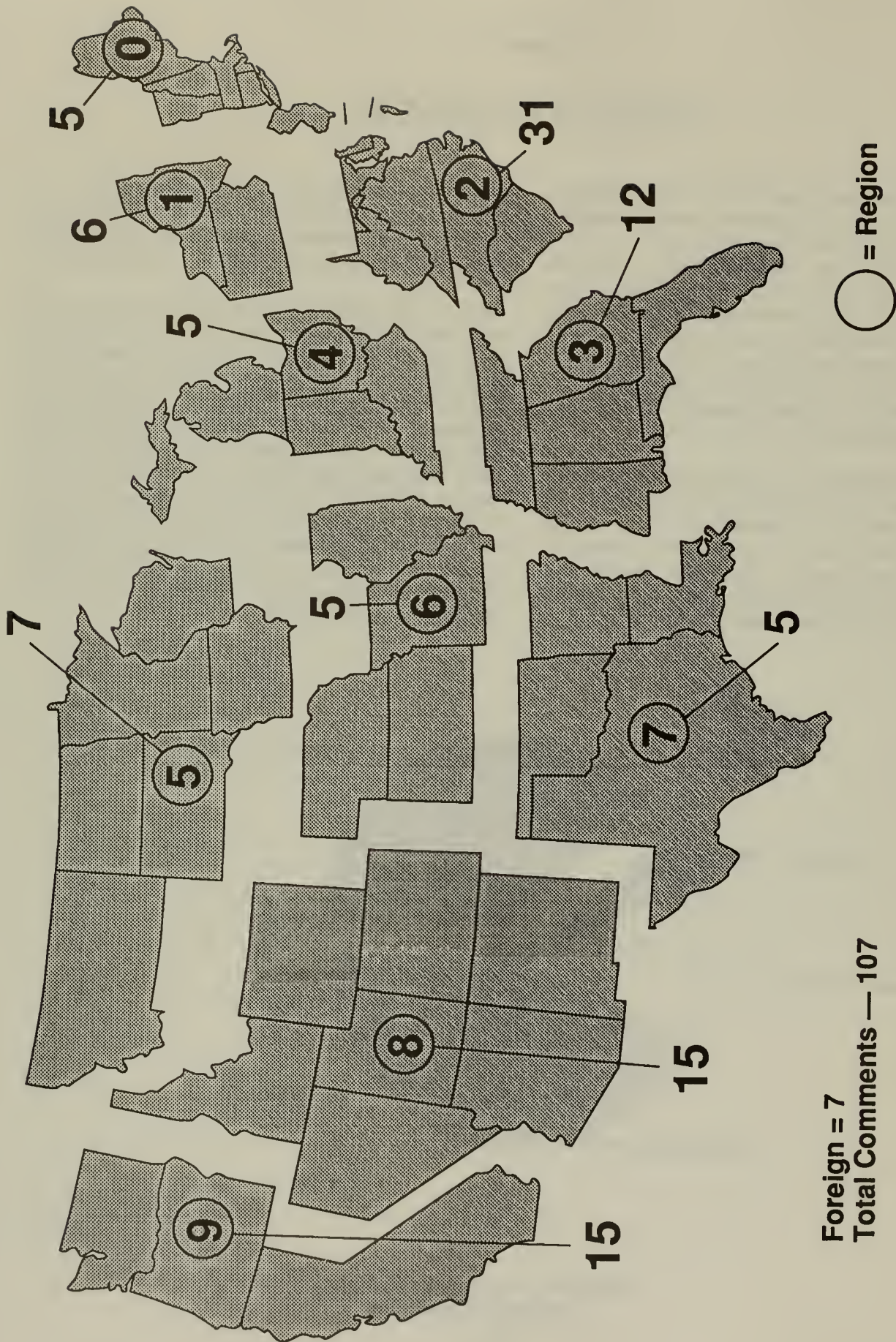


Figure 6. Land Information Study  
 Public Response Summary  
 By Zip Code Regions

# *Appendix A*

## **Section 8, Public Law 100-409**

**(Federal Land Exchange Facilitation Act of 1988)**

**August 20, 1988**

### **Sec. 8. LAND INFORMATION STUDY.**

**(a) Study.** -- The Secretary of the Interior shall conduct an assessment of the need for and cost and benefits associated with improvements in the existing methods of land surveying and mapping and of collecting, storing, retrieving, disseminating, and using information about Federal and other lands.

**(b) Consultation.** -- In conducting the assessment required by this section, the Secretary of the Interior shall consult with the following--

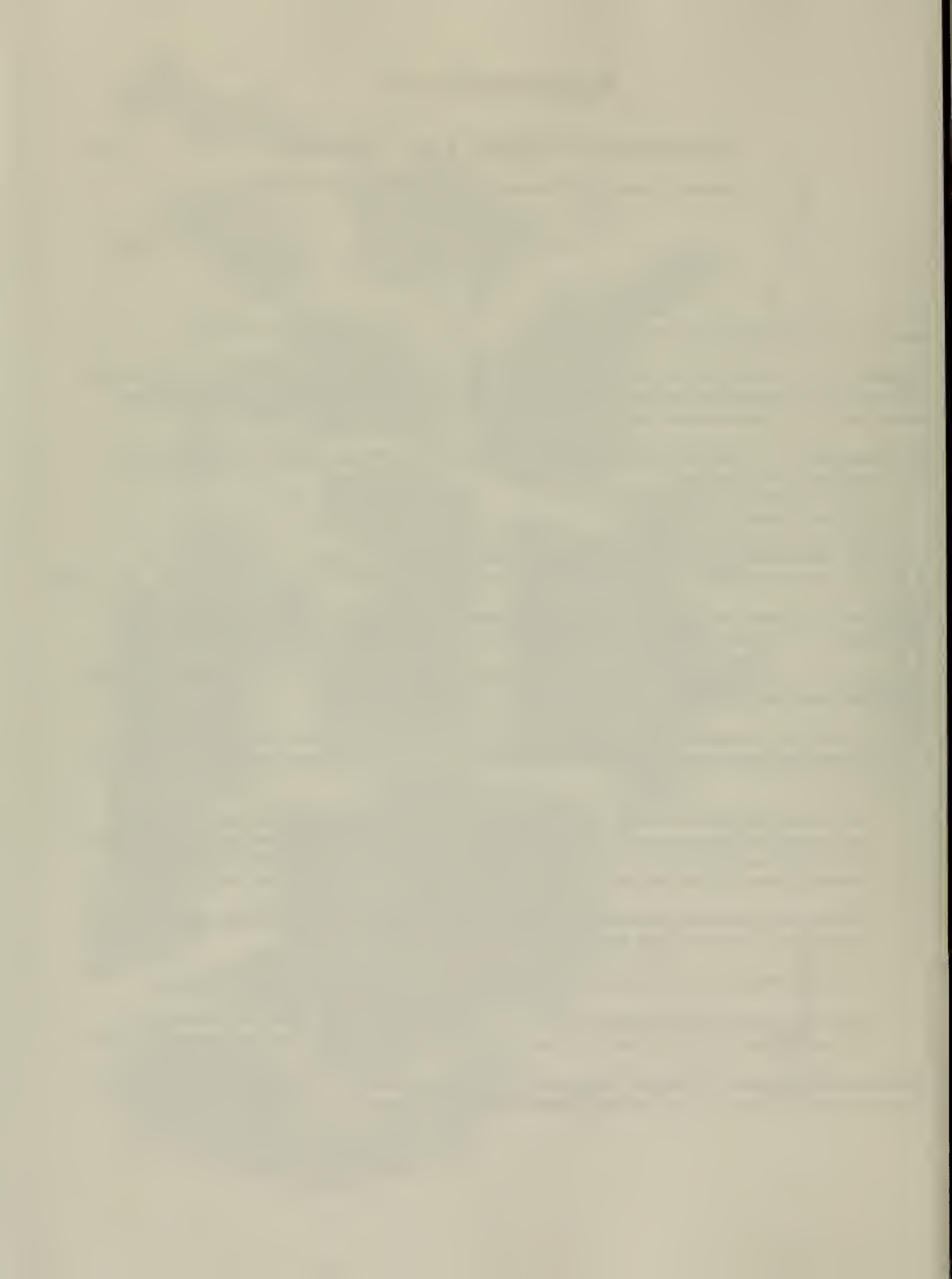
- (1) the Secretary of Agriculture;
- (2) the Secretary of Commerce;
- (3) the Director of the National Science Foundation;
- (4) representatives of State and local governments;
- (5) representatives of private sector surveying and mapping science.

**(c) Report.** -- No later than one year after the day of enactment of this Act, the Secretary of the Interior shall report to the Congress concerning the results of the assessment required by this section.

**(d) Topics.** -- In the report required by subsection (c), the Secretary of the Interior shall include a discussion and evaluation of the following:

- (1) relevant recommendations made by the National Academy of Sciences (National Research Council) on the concept of a multipurpose cadastre from time to time prior to the date of enactment of this Act;
- (2) ongoing activities concerning development of an overall reference frame for land and resource information, including but not limited to a geodetic network, a series of current and accurate large-scale maps, cadastral overlay maps, unique identifying numbers linking specific land parcels to a common index of all land records in United States cadastral systems, and a series of land data files;
- (3) ways to achieve better definition of the roles of Federal and other governmental agencies and the private sector in dealing with land information systems;
- (4) ways to improve the coordination of Federal land information activities; and
- (5) model standards developed by the Secretary for compatible multipurpose land information systems for use by Federal, State and local governmental agencies, the public, and the private sector.

**(e) Recommendations.** -- The report required by subsection (c) may also include such recommendations for legislation as the secretary of the Interior considers necessary or desirable.



## *Appendix B*

# Glossary

**Accuracy:** (1) absolute accuracy (positional) -- the evaluation of all errors encountered in defining the position of a single feature or point on a geodetic datum or system; (2) relative accuracy (positional) -- an evaluation of the errors in determining the position of one point or feature with respect to another.

**Attribute:** data item that characterizes an object.

**Cadastre:** juridicial, a register of ownership of parcels of land; fiscal, a register of properties recording their value; multi-purpose, a register of attributes of spatially-related parcels of land.

**Database:** data organized so that multiple files can be accessed through a single reference, based upon relationships among records on the various files rather than through key values or physical position.

**Database Management:** direction or control of a database through special software that identifies relational values for records, then executes access commands through sequential, direct, or indexed-sequential reference methods, whichever is appropriate to define the relationship specified by the user.

**Database management system (DBMS):** a set of programs for managing a data base.

**Data Capture:** procedures for initially recording and putting data into a system through keyboarding or other methods.

**Data Dictionary:** listing of terms and their definitions for all data items and data stores within an information system.

**Data Element:** basic unit of data that has specific meaning for the system in which it is used.

**Data Structure:** packet of logically related data that can be decomposed into subordinate data components or data elements.

**Digital mapping:** the processes of acquisition (capture), transformation, and presentation of spatial data in digital form.

**Digitizing:** the process of converting spatial and non-spatial data into digital form.

**Discrete Value:** noncontinuous distinct value. Refers to data element that has only specific options, rather than a range of options, for its value.

**Geodesy:** the scientific study of the size and shape of the earth and determination of positions upon it.

**Geodetic Control:** a highly accurate survey network between permanently monumented stations, intended to provide a framework into which less accurate densification surveys and photogrammetric work may be fit.

**Geographic Information System (GIS):** a system of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analyzing, and disseminating information about areas of the earth.

**Information System:** the methods, procedures, and resources for developing and delivering information.

**Infrastructure:** Public works which include highways, mass transit, aviation, water resources, water supply and waste water, solid waste and hazardous waste disposal, as well as communications, energy facilities, schools, hospitals, prisons, and parks.

**Land Information System (LIS):** a GIS that has, as its main focus, data concerning land records, the latter including resource, land use, environmental impact, and fiscal data.

**Land Management:** the management of all aspects of land including the formation of land policies.

**Land Parcel:** a tract of land, being all or part of a legal estate.

**Land Registration:** the recording of rights in land through deeds or as title.

**Land Tenure:** the mode of holding rights in land.

**Land Title:** the evidence of a person's rights to land.

**Layer:** a sub-set of spatial data, selected on a non-spatial basis, that share common characteristics.

**Multipurpose Cadastre (MPC):** a parcel-based LIS. The basic components are a geodetic reference frame (GRF), a base layer that uses the GRF for control, and a cadastral layer that is controlled by references to both the GRF and the features on the base layer. MPC's also integrate a large number of other parcel records keyed to a unique parcel identifier. These ancillary records may include information used for legal reference (legal cadastre), data related to land valuation and taxation (fiscal cadastre), and information for resource and facility management (resource cadastre).

**Metes and Bounds:** a property description by reference to the bearings and lengths of the boundaries and the name of adjoining properties.

**Network (computer):** a system consisting of a computer and its connected terminals and devices. The term is also used to describe two or more interconnected computer systems.

**Orthophotograph:** a composite aerial photograph from which displacements due to relief and camera tilt have been removed.

**Photogrammetry:** the science and art of taking accurate measurements from photographs.

**Photomap:** a map made by printing aerial photographs rather than using abstract conventional signs and symbols.

**Raster:** a regular grid of cells covering an area, usually recorded line by line across a given surface.

**Registration of Deeds:** a system whereby a register of documents is maintained relating to the transfer of rights in land.

**Registration of Title:** a system whereby a register of ownership of land may be maintained based upon the parcel rather than the owner or the deeds of transfer.

**Remote Sensing:** the technique of measuring or obtaining data about an object or phenomenon from its spectral image using a recording device from a distance.

**Spatial:** relating to, occupying, or of the nature of space.

**Spatial Referencing:** the association of an entity with its absolute or relative location.

**Standard:** a specification, test method, definition, classification, or practice that has been approved by the sponsoring group and adopted in accordance with the procedures established within the appropriate laws, regulations, directives or technical society.

**Survey Network:** a network in which the nodes are the precisely determined geodetic control points and the edges represent survey observations.

**Synergistic:** the way that a system's parts function together, producing results with a greater value than would be produced by the system's separate parts working alone.

**System:** a set of interrelated, interacting components that function together as an entity to achieve specific results.

**System Approach:** way of identifying and viewing component parts and functions as integral elements of a whole system.

**Systems Development:** process that includes identifying information needs, designing information systems that meet those needs, and putting those systems into practical operation.

**Topography:** the physical features of the earth's surface.

# Appendix C

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## Appendix D

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# Appendix E

## ONGOING ACTIVITIES - FEDERAL GOVERNMENT

### *Federal Land Information Agencies*

Organization	Organizational Background	Land Info. System Summary
Department of Agriculture (DOA)	<p>The Department of Agriculture (USDA) was created by act of May 15, 1862 (7 U.S.C. 2201), and was administered by a Commissioner of Agriculture until 1889 (5 U.S.C. 511, 514, 516). By act of February 9, 1889 (7 U.S.C. 2202, 2208, 2212), the powers and duties of the Department were enlarged. The Department was made the eighth executive department in the Federal Government, and the Commissioner became the Secretary of Agriculture.</p>	
<i>Soil Conservation Service (SCS)</i>	<p>The Soil Conservation Service (SCS) was established under authority of the Soil Conservation Act of 1935 (16 U.S.C. 590a-f). It has responsibility for developing and carrying out a national soil and water conservation program in cooperation with landowners and operators and other land users and developers, with community planning agencies and regional resource groups, and with other Federal, State, and local government agencies. SCS also assists in agricultural pollution control, environmental improvement, and rural community development.</p>	<p>The Soil Conservation Service (SCS) has a need for accurate geographically referenced land and resource information to accomplish its mission. The SCS needs to know the location of farm fields and ranch pastures as well as the resource characteristics of those fields and pastures. SCS also needs to accurately locate and geographically reference soil survey information as part of its federal leadership role in coordinating the National Cooperative Soil Survey Programs. In support of these activities, the SCS has issued National GIS policy guidelines and is in the process of implementing geographic information system technology at the field office, state office, project office, and national office levels utilizing the USDA's micro-computer procurement. GIS technology will eventually be implemented in more than 3000 SCS offices with the schedule of implementation determined by each State Conservationist. Components of the GIS include the spatial resource data such as soils, topography, land cover, hydrography, field boundaries, etc., and two primary tabular databases, the Soil Survey Database, and the Client Operating Record Database.</p>

## Organization

### *U. S. Forest Service (USDA)*

## Organizational Background

The Forest Service was created by the Transfer Act of February 1, 1905 (16 U.S.C. 472), which transferred the Federal forest reserves and the responsibility for their management from the Department of the Interior to the Department of Agriculture.

The Forest Service has the Federal responsibility for national leadership in forestry. Its mission is to provide a continuing flow of natural resource goods and services to help meet the needs of the Nation and to contribute to the needs of the international community.

## Land Info. System Summary

The USFS needs to know the accurate location of surveyed land ownership boundaries as well as the rights and encumbrances associated with the land. The USFS also needs to relate land information with other spatially located information about natural and constructed features, management direction, and work activities. To accomplish this task, the Forest Service is implementing, in 1991, a Geographic Information System (GIS) at all levels of the organization, with particular emphasis on the Ranger District.

The Forest Service's Geographic Information System is to be a computer-based system to store, retrieve, analyze, and present spatially referenced information about the nearly 200 million acres of national forests and grasslands that it manages. In its Information Resources Management plan for FYs 1989 through 1993, the Service estimated that its costs of developing, implementing, and operating a GIS will be \$167.6 million. Currently the Service is planning how to organize and define its GIS data base.

## Department of the Interior

The Department of the Interior was created by act of March 3, 1849 (43 U.S.C. 1451), which transferred to it the General Land Office, the Office of Indian Affairs, the Pension Office, and the Patent Office. Over the many years of its existence, other functions have been added and removed, so that its role has changed from that of general housekeeper for the Federal Government to that of custodian of the Nation's natural resources. The Department has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of like through outdoor recreation. The Department assesses our mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under United States administration.

## Organization

### *Bureau of Land Management (BLM)*

## Organizational Background

The Bureau of Land Management (BLM) was established July 16, 1946, by the consolidation of the General Land Office (created in 1812) and the Grazing Service (formed in 1943). This was done in accordance with the provisions of sections 402 and 403 of Reorganization Plan No. 3 of 1946 (5 U.S.C. App.). The Federal Land Policy and Management Act of 1976 (90 Stat. 2743) provides a basic mission statement for BLM and establishes policy guidelines and criteria for the management of public lands and resources administered by the BLM.

The BLM is responsible for the total management of 270 million acres of public lands located primarily in the West and Alaska, and another 300 million acres of Federally-owned mineral interests. Resources managed by the Bureau include timber, solid minerals, oil and gas, geothermal energy, wildlife habitat, endangered plant and animal species, rangeland vegetation, recreation and cultural values, wild and scenic rivers, and designated wilderness areas.

As the successor to the General Land Office, the BLM maintains the original Public Land Survey System information dating back to 1785, (including more than five million General Land Office patent documents for the 30 public land states) and is responsible for conducting all new cadastral surveys (which define Federal land boundaries). This information is widely used by other agencies and the private sector, and is represented in different ways by a variety of maps that are based on the original surveys that the BLM maintains.

## Land Info. System Summary

As the land managing agency responsible for more acreage than any other organization in the United States, the BLM's decisions are significant in protecting the Nation's natural resources and providing for appropriate uses of the public lands. The BLM's multiple use mission requires complex analyses of the potential impacts of alternative resource management decisions which range in scope from habitat improvements on one acre to environmental analyses for proposed pipeline rights-of-way extending up to 1,000 miles. As a result, the applications for LIS in the BLM are extensive both in terms of the land area being managed and the conflicts regarding the use of the land. The agency regularly conducts onsite field exams and documents conditions in case files or on mylar overlays. By implementing LIS capabilities throughout all BLM offices in the 1990s, this vast data base will be accessible for subsequent decisions and for public inquiries.

Development and implementation of the LIS is guided by the principles that: (1) the BLM manages information, as well as lands and resources, as a valuable public asset; (2) the BLM shares information with others in support of agency missions; and (3) computer-based tools can help BLM personnel to be more responsive to the needs of society. BLM management has committed to LIS development as a top priority of the agency, with the many associated activities guided through a Master Plan which is updated regularly. These managers recognize that benefits of LIS will be faster responses to public queries, the use of better quality data in many decisions, streamlined processing of cases, and more flexibility in data analysis. The benefit/cost ratio for this automation is more than 2:1. The "bottom line" is that LIS provides the opportunity to make better decisions about the allocation of the Nation's public land resources. Through its LIS, the BLM will coordinate land use inventory, planning, and management activities with other Federal agencies, State and local governments, interest groups and industry, and the general public.

After ensuring that the LIS concept guided the development of automated systems within the agency, the BLM defined as a priority the implementation of a data administration program to meet LIS goals and objectives. The BLM is currently completing the determination of its data requirements and standards, together with the automation of accurate information about public land resources on each parcel. This data base, which is taking approximately a decade to complete, will be a valuable asset well into the next century.

## Organization

Bureau of Land Management (BLM)  
(continued)

## Organizational Background

## Land Info. System Summary

The BLM is preparing standards for public land resources data in cooperation with other Federal agencies, including the U.S. Forest Service and the U.S. Geological Survey. The BLM is also participating with other Federal agencies in the development of standards for the exchange and sharing of data, and is providing support for defining the spatial data transfer standards. After the land parcel data is automated, the BLM uses existing Geographic Information System (GIS) technology to retrieve and display land status records (such as ownership and existing leases or permits for use) and natural resource information. Currently, the BLM has outgrown its computer capacity, so a target system procurement in the early 1990s will provide for new capabilities so all BLM offices can use LIS to support daily operations.

One of the first components of LIS to be implemented through this procurement will be the Automated Land and Mineral Record System (ALMRS). When fully implemented, the LIS data base will include: (1) the land and mineral records data to provide information about land status and authorizations (essentially the property rights and use permits affecting the public lands); (2) Automated Resource Data (ARD) including the resource values, management concerns, and characteristics of the land as well as base data about topography, hydrography, transportation, and basic cultural features; (3) the automated Geographic Coordinate Data Base (GCDB) built upon survey descriptions of legal land parcels, which are defined by the Public Land Survey System in most states. This data base will enable the combination of data registered to legal land parcels, such as ownership, with resource or map data registered to other coordinate systems (i.e., latitude/longitude). The GCDB will also include the capability for surveys of parcels where legal land descriptions are based on something other than the rectangular survey system.

## Organization

### *Bureau of Reclamation (BOR)*

## Organizational Background

The Reclamation Act of 1902 (43 U.S.C. 371 et seq.) authorized the Secretary of the Interior to administer a reclamation program that would provide the arid and semiarid lands of the 17 contiguous Western States a secure, year-round water supply for irrigation. The Reclamation Service was created within the U.S. Geological Survey. In 1907 the Reclamation Service was separated from the Survey, and in 1923 the name was changed to Bureau of Reclamation.

The Bureau provides water for farms, towns, and industries, and is responsible for the generation of hydroelectric power, river regulation and flood control, outdoor recreation opportunities, and the enhancement and protection of fish and wildlife habitats.

## Land Info. System Summary

There is a significant need for improvement of Reclamation's methods of land surveying and mapping. Major problem areas include: securing sufficient funds for the activity; coordination with the Bureau of Land Management on priorities and other issues; and integration of advanced technology, such as realizing geographic information system (GIS) potentials. A Steering Committee has been established to investigate desired modifications of Reclamation's Land Use Inventory and Real Property System (LAPS). The Committee held its initial meeting in February 1989.

Reclamation has several ongoing activities concerning development of an overall geographic reference framework for land resource information including geodetic networks, large scale maps, cadastral overlay maps, unique land parcel numbers (not, however, necessarily tied to a common index of all land records in the United States cadastral system), and a series of land data files. Coordination of these activities in Reclamation is, however, not centralized. Each Reclamation regional and/or project office may, or may not, have programs in the identified subjects that are not reported to Reclamation's headquarters office in Denver, Colorado.

Various GIS projects have been undertaken that use natural geodetic frameworks for cadastral reference. Geodetic networks and large scale maps are typically prepared to national geodetic frameworks. LAPS contains unique tract numbers for each parcel of land, and/or each land right (withdrawals, easements, mineral rights, etc.) under Reclamation's jurisdiction. LAPS also constitutes a system of land data files for all land and land rights under Reclamation's jurisdiction.

## Organization

### *Minerals Management Service (MMS)*

## Organizational Background

The Minerals Management Service (MMS) was established on January 19, 1982, by Secretarial Order No. 3071, under the authority provided by section 2 or Reorganization Plan No. 3 of 1950 (5 U.S.C. App). MMS assesses the nature, extent, recoverability, and value of leasable mineral on the Outer Continental Shelf. It ensures the orderly and timely inventory and development, as well as the efficient recovery, of mineral resources; encourages utilization of the best available and safest technology; provides for fair, full and accurate returns to the Federal Treasury for produced commodities; and safeguards against fraud, waste, and abuse.

MMS is responsible for resource evaluation and classification, environmental review, leasing activities, lease management, and inspection and enforcement programs; collection of all royalty payments, rentals, bonus payments, fines, penalties, assessments, and other revenues due the Federal Government.

## Land Infor. System Summary

The Offshore Program of the Minerals Management Service is a major user of map-based data. MMS areas of responsibility is off the coast and outside the three mile state boundaries but is based in onshore and coastline references. As a major user of data provided by others, we are vitally interested in accuracy, integrity, and currency of the data and in the standardization of formats/definitions. Offshore computes lease blocks and line from known reference points onshore. These extrapolation techniques dictate the requirement for a high degree of accuracy in the onshore baseline data. Data transfer in digital form, consistent with established standards, would reduce the risk of error and increase our productivity.

MMS has coordinated extensively with other agencies, State governments, and private industry in the development of these systems. Data bases have been validated and are continually updated with information obtained from outside sources. Access systems have been established so that State and Tribal governments can readily obtain MMS data. More detailed descriptions of these activities were considered too voluminous for this response, but will be provided on request.

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### *National Park Service (NPS)*

The National Park Service was established in the Department of the Interior on August 25, 1916 (16 U.S.C. 1). The National Park Service administers for the American people an extensive system of national parks, monuments, historic sites, and recreation areas. The National Park Service objectives are to administer the properties under its jurisdiction for the enjoyment and education of our citizens, to protect the natural environment of the areas, and to assist States, local governments, and citizen groups in the development of park areas, the protection of the natural environment, and the preservation of historic properties.

At present, each agency, or bureau, based on its specific mission, follows its own procedures and requirements and individually controls its data used in support of mapping. It would appear that there is quite a bit of basic information that is duplicated and developed in many different ways. If a source were in place where an agency or bureau could obtain basic information in a uniform format, it would provide for a Government-wide basic uniformity that each agency or bureau could build upon to meet its individual requirements.

The concept of a designated agency role with quality input from all agencies and bureaus to develop a model system for all Federal lands (estimated at 32 percent of the total land in the United States) which also recognizes the mission of a bureau or agency as well as the requirements of unification of basic data appears feasible. The model system, once in place, could then be expanded for special usage and also for local governments to build upon.



## Organization

*Office of Surface Mining / Reclamation and Enforcement (OSMRE)*

*U.S. Fish & Wildlife Service (USFWS)*

## Organizational Background

The Office of Surface Mining Reclamation and Enforcement (OSMRE) was established in the Department of the Interior by the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1211). The primary goal of the Office is to assist the States in developing a nationwide program that protects society and the environment from the adverse effects of coal mining, while ensuring that surface coal mining can be done without permanent damage to land and water resources. The Office's main objectives, now that most coal-mining States have assumed primary responsibility for regulating coal mining and reclamation activities within their borders, are to oversee mining and reclamation in States with primary responsibility, to assist States in meeting the objectives of the act, and to regulate mining and reclamation activities in those States choosing not to assume primary responsibility.

In 1970, under Reorganization Plans 3 and 4 (5 U.S.C. App.), the Bureau of Commercial Fisheries was transferred to the Department of Commerce. The Bureau of Sport Fisheries and Wildlife, which remained in Interior, was renamed by an act of Congress in April 1974 (16 U.S.C. 742b) as the United States Fish and Wildlife Service.

The mission of the United States Fish and Wildlife Service, which is responsible for migratory birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. In the area of resource management, the Service provides leadership for the protection and improvement of land and water environments (habitat preservation), which directly benefits the living natural resources and adds quality to human life.

## Land Info. System Summary

OSMRE does not maintain any land information collection systems using cadastral mapping that would link specific land parcels to a common index of land records. Nor is OSMRE engaged in any coordination efforts with other Federal agencies, State or local governments or private sector entities concerning such systems.

\* \* \*

The U.S. Fish and Wildlife Service (Service) does not currently have an automated land record system. It is, however, in the process of developing such a system for the conversion of manually maintained card records. These card records are utilized throughout all our Regional Offices and contain information specific to lands managed as part of the refuge system. These records cover lands acquired through purchase, exchange, or other acquisition methods as well as acquired through transfer or withdrawal actions. In addition, these records also contain acreage summaries by county boundaries, by acquisition authority or funding, and include State or specific unit breakdowns. We have recently completed "Phase One" of this effort and expect to have all this information completely automated by year's end.

The Service also has its own survey function, which often works closely with the Bureau of Land Management, which provides us with (directly or through contracting) survey plats and all other Service survey requirements. Tract numbers assigned are done in conjunction with the above cited card record system. Each Region also maintains a cartographic unit which provides land tract, status, and acquisition boundary maps. All of the systems described share and include identifying numbers linking our records and data files.

## Organization

### *U.S. Geological Survey (USGS)*

## Organizational Background

and products of the national domain." Topographic mapping and chemical and physical research were recognized as an essential part of the investigations and studies authorized by the Organic Act of 1879, and specific provision was made for them by act of October 2, 1888 (25 Stat. 526). The act of September 5, 1962 (43 U.S.C. 31(b)), expanded this authorization to include such examinations outside the national domain.

The mission of the U.S. Geological Survey is to provide geologic, topographic, and hydrologic information that contributes to the wise management of the Nation's natural resources and that promotes the health, safety, and well-being of the people. This information consists of maps, data bases, and descriptions and analyses of the water, energy, and mineral resources, land surface, underlying geologic structure, and dynamic processes of the Earth. To accomplish its mission, the Survey:

- \* Conducts and sponsors research in geology, hydrology, mapping, and related sciences.
- \* Produces and updates geographic, cartographic, and remotely sensed information in graphic and digital forms.
- \* Describes the onshore and offshore geologic framework and develops an understanding of its formation and evolution.
- \* Assesses energy and mineral resources, determines their origin and manner of occurrence, and develops techniques for their discovery.
- \* Collects and analyzes data on the quantity and quality of surface water and ground water, on water use, and on quality of precipitation.
- \* Assesses water resources and develops an understanding of the impact of human activities and natural phenomena on hydrologic systems.
- \* Evaluates hazards associated with earthquakes, volcanoes, floods, droughts, toxic materials, landslides, subsidence, and other ground failures, and develops methods for hazards prediction.
- \* Participates in the exploration of space and prepares geologic and other maps of the planets and their satellites.

USGS acquires, analyzes, manages, and disseminates large volumes of spatial and attribute data to accomplish its mission. The data originates from source material in multiple formats, such as text, maps, charts, or remotely sensed imagery. The

## Land Info. System Summary

primary USGS objective regarding land information handling is to develop and maintain digital spatial data bases comprised of earth science information that is useful to the public for a wide variety of purposes and, at the same time, useful within USGS for generating, revising, analyzing, and managing information including standard and derivative graphics and digital products.

In 1979, the USGS received funding appropriations that formally initiated the Digital Cartography Program. More recently, a major new effort called Mark II was begun that will implement both advance cartographic technologies and production procedures to satisfy National Mapping Program requirements through the year 2000. By 2000, the National Digital Cartographic Data Base (NDCDB) is scheduled to contain digital data representing the content of the primary map series and other scale series, as appropriate. USGS produces and maintains the largest scale (1:24,000) national map coverage of the United States. The maps meet National Map accuracy Standards and are inspected and revised on a priority basis. These maps do not contain private ownership information, but do contain a cadastral framework in the 30 public land survey States. These maps also serve as the base for many layers of resource information, such as soils, woodlands, wetlands, and minerals.

OMB has formed a Federal Interagency Coordinating Committee on Digital Cartography to facilitate the coordination of agency activities and exchange of data; to collect and compile information on Federal agencies digital cartographic activities; to determine which categories of digital data are to be included in the National Digital Cartographic Data Base; and to develop and adopt common standards of content, format, and accuracy for digital cartographic base data. USGS has been assigned to chair this committee.

## Organization

### Department of Transportation (DOT)

## Organizational Background

The Department of Transportation was established by the act of October 15, 1966 (80 Stat. 931; 49 U.S.C. 1651 note) "to assure the coordinated, effective administration of the transportation programs of the Federal Government" and to develop "national transportation policies and programs conducive to the provision of fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith." It became operational in April 1967, and is comprised of elements transferred from eight other major departments and agencies.

### *Federal Highway Administration (FHWA)*

The Federal Highway Administration (FHWA) became a component of the Department of Transportation pursuant to the Department of Transportation Act (80 Stat. 931) It carries out the highway transportation programs of the Department of Transportation under pertinent legislation or provisions of law cited in section 6(a) of the act. FHWA encompasses highway transportation in its broadest scope, seeking to coordinate highways with other modes of transportation to achieve the most effective balance of transportation systems and facilities under cohesive Federal transportation policies as contemplated by the act. FHWA is concerned with the total operation and environment of highway systems, including highway safety. In administering its highway transportation program, FHWA gives full consideration to the impacts of highway development and travel, transportation needs, engineering and safety aspects, and project costs. FHWA ensures balanced treatment of these factors by utilizing a systematic, interdisciplinary approach in providing for safe and efficient highway transportation.

## Land Info. System Summary

FHWA has been actively promoting GIS uses for transportation in cooperation with other Federal and State officials. Efforts include development of (1) the capability to graphically display roadway information from the Highway Performance Monitoring System which displays data on the National System of Interstate and Defense Highways; (2) a Highway Traffic Forecasting System. Its primary function is to analyze truck size and weight issues; and (3) a GIS which contains socio-economic data, county business studies, and forecasts by the Bureau of Economic Analysis.

The agency is working with other Federal and State agencies on GIS uses. For example, they are working with the State highway agencies to develop GISs for relating highway features to specific locations on a computerized map, as well as for information systems that would include rights-of-way for highways, and the relationship between transportation and land use.

DOT has established a Digital Cartographic Interest Group. Each Modal Administration participates (the Federal Aviation Administration, the Federal Railroad Administration, etc.). The goal is to produce a nationwide, multimodal network for all transportation modes using a common coordinate system, with linkage to a sub-network for each type of transportation.

# Other Agencies

## Organization

### Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) was established in the executive branch as an independent agency pursuant to Reorganization Plan No. 3 of 1970 (5 U.S.C App.), effective December 2, 1970. The EPA was created to permit coordinated and effective governmental action on behalf of the environment. EPA endeavors to abate and control pollution systematically, by proper integration of a variety of research, monitoring, standard setting and enforcement activities. As a complement to its other activities, EPA coordinates and supports research and anti-pollution activities by State and local governments, private and public groups, individuals, and educational institutions. EPA also reinforces efforts among other Federal agencies with respect to the impact of their operations on the environment, and it is specifically charged with publishing its determinations when those hold that a proposal is unsatisfactory from the standpoint of public health or welfare or environmental quality. In all, EPA is designed to serve as the public's advocate for a livable environment.

### Federal Communications Commission (FCC)

The Federal Communications Commission (FCC) was created by the Communications Act of 1934 (15 U.S.C.; 21 U.S.C.; 47 U.S.C. 35, 151) to regulate interstate and foreign communications by wire and radio in the public interest. The scope of its regulation includes radio and television broadcasting; telephone, telegraph, and cable television operation; two-way radio and radio operators; and satellite communication. It is responsible for the orderly development and operation of broadcast services and the provision of rapid, efficient nationwide and worldwide telephone and telegraph services at reasonable rates. This also include the promotion of safety of life and property through radio and the use of radio and television facilities to strengthen the national defense.

## Land Info. System Summary

The USEPA is using a GIS in their Direct/Delayed Response Project (DDRP), a comprehensive study to evaluate the future chemical status of surface waters to acidic deposition. The project is being undertaken in three regions of the eastern United States where surface waters of low acid-neutralizing capacity exist and where levels of acidic deposition are the greatest. Although this project was initiated and is administered by the EPA, four other Federal agencies (U.S. Department of Agriculture, U.S. Geological Survey, U.S. Forest Service, and National Oceanic and Atmospheric Administration) are involved, as well as numerous other cooperators.

In such an environment, a GIS was perceived as a tool that could provide unique capabilities to combine various data sets, to perform complex spatial analyses, and to effectively communicate the results to key scientific, policy, and governmental personnel as well as to a concerned public. As a result, the EPA acquired a GIS in 1985. Since the GIS has been acquired, it has been incorporated into virtually every level of project research. GIS based activities include locational and logistical support, analyses, and communication of results.

Effective communication of scientific results facilitates the transfer of knowledge gained in the project to concerned individuals or groups. In this role, the GIS is a particularly valuable tool. Communication involves the display of "final" results as well as "what if" scenarios and modeling results. Results obtained from the Direct/Delayed Response Project likely will have significant national policy implications with regard to legislation pertaining to emissions that cause acidic deposition. By incorporating a GIS in the DDRP research, the timeliness and quality of the project has been increased.

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The FCC has fifteen (15) properties around the country it owns and manages.

**Organization**

**Federal Emergency Management Agency (FEMA)**

**Organizational Background**

The Federal Emergency Management Agency (FEMA) was established in the executive branch as an independent agency pursuant to Reorganization Plan No. 3 of 1978 (5 U.S.C. App.) and Executive Orders 12127 of March 31, 1979 (effective April 1, 1979), and 12148 of July 20, 1979 (effective July 15, 1979). FEMA was created to provide a single point of accountability for all Federal emergency preparedness, mitigation, and response activities. The Agency is chartered to enhance the multiple use of emergency preparedness and response resources at the Federal, State, and local levels of government in preparing for and responding to the full range of emergencies - natural, technological, and attack-related- and to integrate into a comprehensive framework activities concerned with hazard mitigation, preparedness planning, relief operations, and recovery assistance.

Under the direction of the President, the mission of the Federal Emergency Management Agency (FEMA) is to plan for, and coordinate, the protection of the population and resources of the Nation, to include the planning for the continuity of constitutional government in time of emergency.

**Land Info. System Summary**

The nature of FEMA's mission requires cooperation with the multiple levels of governmental agencies, and demands complex analysis of specially related phenomena at the local, regional, and national level. FEMA programs supporting this mission have a single element in common: the need for spatial information, organized in a manner to support rapid and effective simultaneous data usage by Federal, State, and community agencies. As a result, the application of GIS technology for large scale data analysis and management has been of primary importance to the Agency.

GIS research and development sponsored by FEMA has been directed to development of software capable of supporting a large-scale network of independent, stand-alone work stations with associated local data bases, in conjunction with a national distributed data processing system for specially related information. This software is know as the Integrated Emergency Management Information System (IEMIS). Goals of IEMIS include: (1) to provide a mechanism for the application of state-of-the-art automated data processing (ADP) technology to emergency management; (2) to establish a dedicated, interactive computer system for the Nation's emergency management community; and (3) to encourage the use of such technology for training, planning, exercising and actual emergency operations.

Recently, the Office of the President has clarified the role of Agencies in declared National Security Emergencies with Executive Order 12656. This order directs Agencies to cooperate in the generation of information while retaining the independent statutory responsibilities assigned by the Congress. Practical implementation of E.O. 12565 and the realities of budget constraints can be expected to encourage the generation of national GIS libraries within a cooperative setting, while requiring a maximum of independent action at the lowest practicable level of government.

## Organization

### Department of Housing and Urban Development (HUD)

## Organizational Background

HUD was established by the Department of Housing and Urban Development Act (42 U.S.C. 3532-3537), effective November 9, 1965. HUD is the Federal agency principally responsible for programs concerned with the Nation's housing needs, the development and preservation of the Nation's communities, and the provision of equal housing opportunity for every individual.

In administering out its responsibilities, the Department administers a wide variety of programs, including: Federal Housing Administration mortgage insurance programs that help families become homeowners and facilitate the construction and rehabilitation of rental units; rental assistance programs for lower income families who otherwise could not afford decent housing; the Government National Mortgage Association mortgage-backed securities program that helps ensure an adequate supply of mortgage credit; programs to combat housing discrimination and to affirmatively further fair housing; programs that aid community and neighborhood development and preservation; and programs to help protect the home buyer in the marketplace. The Department also takes steps to encourage a strong, private sector housing industry that can produce affordable housing, and to stimulate private sector initiatives, public/private sector partnerships, and public entrepreneurship.

### Department of Energy (DOE)

The Department of Energy (DOE) was established by the Department of Energy Organization Act (42 U.S.C. 7131), effective October 1, 1977, pursuant to Executive Order 12009 of September 13, 1977. DOE provides the framework for a comprehensive and balanced national energy plan through the coordination and administration of the energy functions of the Federal Government. The Department is responsible for long-term, high-risk research and development of energy technology; the marketing of Federal power; energy conservation; the nuclear weapons program; energy regulatory programs; and a central energy data collection and analysis program.

## Land Info. System Summary

Among the findings and purposes of The Real Estate Settlement Procedures Act (RESPA) of 1974 As Amended in 1975: "... to effect certain changes in the settlement process for residential real estate that will result in significant reform and modernization of local record-keeping of land title information."

Section 13 of RESPA, "ESTABLISHMENT ON DEMONSTRATION BASIS OF LAND PARCEL RECORDATION SYSTEM," states: "The Secretary [Secretary of Housing and Urban Development] shall establish and place in operation on a demonstration basis, in representative political subdivisions (selected by him) in various areas of the United States, a model system or systems for the recordation of land title information in a manner and form calculated to facilitate and simplify land transfers and mortgage transactions and reduce the cost thereof, with a view to the possible development (utilizing the information and experience gained under this section) of a nationally uniform system of land parcel recordation."

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The DOE maintains DOE's Real Property Inventory System (RPIS) which is a computerized data base containing detailed information on Departmentwide real property holdings. At the present time, the preponderance of data in the RPIS pertains to buildings and other structures and facilities rather than land. However, they are in the process of converting the General Services Administration's generic real property system called Foundation Information for Real Property Management (FIRM) to the RPIS which will result in our having more detailed data on DOE's land holdings. This office does not, however, maintain land records (deeds, maps, title reports, etc.). All land records are maintained at the DOE field office level.

To accomplish its diverse and complex missions, the DOE relies on a physical plant that stretches over 33 states and includes some of the world's most sophisticated and costly facilities. Not counting the 2.3 million acres of land controlled by DOE, the 1987 replacement value of this real property is approaching \$40 billion. To accomplish assigned tasks, DOE adds to this plant at the rate of \$2 billion per year. Maintenance costs for these facilities exceeded \$700 million in FY 1987 and required the services of thousands of Federal and contractor employees spread over 50 major sites and numerous minor ones.

## Organization

## Organizational Background

## Land Info. System Summary

### Department of Energy (DOE) (continued)

To assist in the tracking, reporting and management of this real property, the Department has in place an automated inventory system that lists pertinent information regarding these facilities. The system, called the Real Property Inventory System (RPIS), is an integrated data base which is maintained by the DOE field organizations. Within the next fiscal year, the RPIS will be converted into a new data base structure using modern software technology called Oracle and SQL Plus. This new system will provide managers with the necessary tools to better govern their real property assets from acquisition to disposal. An important advantage for the RPIS-II is the simplification of data entry procedures and data retrieval with emphasis on being more user friendly.

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### Nuclear Regulatory Commission (NRC)

The Nuclear Regulatory Commission (NRC) was established as an independent regulatory agency under the provisions of the Energy Reorganization Act of 1974 (42 U.S.C. 5801) and Executive Order 11834 of January 15, 1975, effective January 19, 1975. The NRC's purpose is to ensure that the civilian uses of nuclear materials and facilities are conducted in a manner consistent with the public health and safety, environmental quality, national security, and the antitrust laws. The major share of the Commission effort is focused on regulating the use of nuclear energy to generate electric power.

The NRC uses land information in two main ways. One for environmental and safety reviews of license applications or renewals, and two for emergencies. The land information should be the latest and best available at the time of a license application or renewal. However, unless it is periodically updated land information maybe inadequate and or inaccurate when used in the event of an emergency at some future time. Written reports submitted by licensees that describe the following aspects of each site and vicinity: demography, socioeconomic, land use, hydrology, geology, mineral resources, seismicity, terrestrial ecology, and aquatic ecology. Therefore, the need exists for updating specific information such as demographic, seismic activity, road networks, etc., and for having these data in a form readily used by constituents e.g., licensees, FEMA, state, and local governments.

Presently, the NRC uses USGS maps. Often these maps are outdated and occasionally inaccurate, thereby reducing their value. A desired future system would provide digitized maps produced from remote sensing for accuracy and quick updates. Digitization should be standardized for use by any government agency or private concern dealing with Federal Government requirements.

## Organization

## Organizational Background

## Land Info. System Summary

### General Services Administration (GSA)

The General Services Administration (GSA) was established by section 101 of the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 751). The GSA establishes policy and provides for the Government an economical and efficient system for the management of its property and records, including construction and operation of buildings, procurement and distribution of supplies, utilization and disposal of property, transportation, traffic, and communications management, stockpiling of strategic materials, and the management of the Governmentwide automatic data processing resources program.

Executive Order 12512 designated GSA to take the lead in real property information management. The design, programming, and pilot testing of Foundation Information for Real Property Management system (FIRM), an automated management system, occurred in FY 1987. There are 22 government agencies in the Washington, D.C. area participating in FIRM. This operational system is designed to be operated by real property specialists and is available without charge to interested Federal agencies.

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### International Development Cooperation Agency (IDCA)

The International Development Cooperation Agency (IDCA) was established by Reorganization Plan No. 2 of 1979 (5 U.S.C. App.), effective October 1, 1979, to be a focal point within the U.S. Government for economic matters affecting U.S. relations with developing countries. The IDCA's function is policy planning, policy making, and policy coordination on the range of international economic issues affecting developing countries. The Agency's mission is twofold: first, to ensure that development goals are taken fully into account in all executive branch decision making on trade, financing and monetary affairs, technology, and other economic policy issues affecting the less developed nations; and second, to provide coherent development strategy through the effective use of U.S. bilateral development assistance programs and U.S. participation in multilateral development organizations.

The power of GIS in addressing the link between economic development and sustainable agricultural development and makes spatial analysis particularly attractive to the Agency for International Development (AID). AID sees the application of GIS technology in new programs to combat global deforestation and to conserve the rich biological diversity in tropical countries. Because of the diverse environmental conditions and economic goals in the 70-plus countries that AID assists, GIS development is decentralized. Several GIS's have been procured off-the-shelf for national and regional institutions in developing countries.

The major push for GIS development and applications in the Third World countries will come from the need to manage social and economic growth while simultaneously protecting the environment and conserving natural resources. Today, not only is there a proliferation of data bases even in formerly data-scarce developing countries, but the increasing number of global data bases is becoming a problem. Many of them are not easily accessible from a technological, economical, or political perspective.

AID plans to analyze this problem of global data-base networking during the next 5 years and to take steps, in cooperation with other major foreign assistance donors, to enable developers, suppliers, and users of environmental data to communicate electronically with each other. The goal is to provide a better understanding of the way that environment and natural resources interact with human development.



## Organization

### National Aeronautics and Space Administration (NASA)

## Organizational Background

The National Aeronautics and Space Administration (NASA) was established by the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2451 et seq.) In carrying out the policy of Congress that activities in space should be devoted to peaceful purposes for the benefit of all humankind, the principal statutory functions of NASA are to conduct research for the solution of problems of flight within and outside the Earth's atmosphere and develop, construct, test, and operate aeronautical and space vehicles; conduct activities required for the exploration of space with manned and unmanned vehicles; arrange for the most effective utilization of the scientific and engineering resources of the United States with other nations engaged in aeronautical and space activities for peaceful purposes; and to provide for the widest practicable and appropriate dissemination of information concerning the agency's activities and their results.

### United States Postal Service (USPS)

The U.S. Postal Service was created as an independent establishment of the executive branch by the Postal Reorganization Act (39 U.S.C. 101 et seq.), approved August 12, 1970. The U.S.P.S. commenced operations on July 1, 1971. The U.S.P.S. provides mail processing and delivery services to individuals and businesses within the United States. The U.S.P.S. is committed to the development of efficient mail-handling systems and operates its own planning and engineering programs. It is also the responsibility of the U.S.P.S. to protect the mails from loss or theft and to apprehend those who violate postal laws.

The Tennessee Valley Authority (TVA) is a corporation created by act of May 18, 1933 (48 Stat. 58; 16 U.S.C. 831-831dd). TVA is a Government-owned corporation that conducts a unified program of resource development for the advancement of economic growth in the Tennessee Valley region. The Authority's program of activities includes flood control, navigation development, electric power production, fertilizer development, recreation improvement, and forestry and wildlife development. While its power program is financially self-supporting, other programs are financed primarily by appropriations from Congress.

## Land Info. System Summary

The Facilities Management Office, NASA Headquarters, through its Facilities Operations and Maintenance Division has the responsibility for the management of NASA real estate, and as such maintains a central depository for all pertinent agencywide land records. Individual records are maintained at each of our land holding installations and additional land use data is detailed in master planning records.

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The U.S. Postal Service has maintained a facilities data management system since 1973. Information is kept on approximately 5,200 owned and 29,600 leased properties. Although the major thrust of the system is to control building acquisition, maintenance, use and disposal, it contains the following associated land information: (1) Location by street address, city, county, state, and zip code; (2) Date acquired; (3) Acquisition cost (but not current value); (4) How land is controlled (leased vs. owned); (5) Status (in use, vacant, surplus, etc.); (6) Site size in square feet. The remaining information is kept in manual files located among 21 field offices.

## Organization

## Organizational Background

## Land Info. System Summary

### Tennessee Valley Authority (TVA)

TVA operates the river control system and provides assistance to State and local governments in reducing local flood problems. It is the wholesale power supplier for many local municipal and cooperative electric systems serving customers in parts of seven states. In economic and community development programs, TVA provides technical assistance in areas including industrial development, regional waste management, tourism promotion, community preparedness, and vanpool organizations.

The TVA has been a leader in demonstrating innovative applications of new technologies to better serve the resource development needs of the region. Up-to-date information about the status of the lands, waters, and natural resources of the seven-State region is a key tool in development. GIS technology has evolved rapidly as a more effective means of delivering this information to resource managers. GIS methods have become an integral component of the management of the land base surrounding the TVA reservoir system. In addition, TVA is playing a growing role in the integration, interpretation, and delivery of resource data compiled by the agency and other agencies to decisionmakers throughout the region.

TVA's Geographic Information System office, at Norris, Tennessee, operates a GIS to compile integrated resource data bases and conducts spatial modeling projects to support TVA regional development programs. The GIS is operated as a self-supporting service function. GIS services are marketed to all TVA programs as well as other Federal, State, and local agencies in the region. A primary application of the GIS is in planning for the development of the 300,000 acre land base surrounding the TVA reservoir system. A Multidisciplinary team uses the GIS to compile an integrated data base that includes 37 layers of information about the lands around each reservoir. In addition to planning the management of agency lands, TVA's GIS has supported over 350 other regional and site-specific projects including the planning of electric power generation and transmission facilities, industrial site screening, and the monitoring of regional economic and environmental trends. GIS services are also used on a reimbursable basis by other agencies.

### U. S. Department of Commerce (DOC)

The Department was designated as such by act of March 4, 1913 (15 U.S.C. 1501), which reorganized the Department of Commerce and Labor, created by act of February 14, 1903 (15 U.S.C. 1501), by transferring all labor activities into a new, separate Department of Labor. The Department of Commerce is composed of the Office of the Secretary and the operating units.

## Organization

### *Bureau of the Census (BOC)*

## Organizational Background

The Bureau of the Census was established as a permanent office by act of March 6, 1902 (32 Stat. 51). The major functions of the Bureau are authorized by the Constitution, which provides that a census of population shall be taken every 10 years, and by laws codified as title 13 of the United States Code. The Bureau is a general-purpose statistical agency that collects, tabulates, and publishes a wide variety of data about the people and the economy of the Nation. These data are utilized by the Congress, by the executive branch, by state and local governments and by the public generally in the development and evaluation of economic and social programs.

## Land Info. System Summary

The Geography Division of the Census Bureau is orchestrating the development of a major new computer system that will automate the mapping and related geographic activities required to support the census and survey programs of the Census Bureau for years to come, starting with the 1990 decennial census. To store the computer-readable map information and integrate it with the geographic "attributes" needed for census-taking and data dissemination purposes, such as street names, address ranges, geographic boundaries, and geographic identifiers, the Geography Division developed a unique new file structure called the Topologically Integrated Geographic Encoding and Referencing file, or TIGER file. The TIGER file uses the soundness of a mathematically-based description to store the geographic structure of the United States and its possessions. This structure will be used in combination with the latest concepts in computer science, operating on powerful new computer equipment, to produce this integrated geographic data base. It will do two basic jobs: first, assign each housing unit and business establishment to the correct geographic location, (for example, a city block); and second, classify the assigned location into each of the tabulation areas recognized in a particular census or sample survey.

Beginning as far back as 1850, the Bureau of the Census also has taken a census of "wealth, debt, and taxation," usually at 10-year intervals. The "wealth" part consisted of findings from enumeration and compilation of assessed values, the parcel-based work products of the nation's property tax assessors, usually county or other local officials. At least since 1957, the Governments Division has had the responsibility for conducting a Census of Governments in every 5th year, covering the subject areas of government organization, public employment, governmental finances, and taxable property values. The Governments Division organizes its operational and reporting work, in "land records" terms, on the basis of boundaries of general purpose governments. With regard to the taxable property values survey, the Governments Division orients its work to the cadastral parcel, the building block that makes possible a hierarchy of coverages, from individual ownerships (though confidentiality requirements preclude publication at this level), to individual jurisdictions, to entire States, to the nation as a whole. Cooperation extended by the 13,500 assessors and 4,000 recording officials is a prerequisite for completion of any taxable property values survey. Thus, in a vital sense, the Governments Division is a user of local land records and local cadastral maps.

## Organization

*National Oceanic & Atmospheric Administration (NOAA)*

## Organizational Background

The National Oceanic and Atmospheric Administration (NOAA) was formed on October 3, 1970, by Reorganization Plan No. 4 of 1970 (5 U.S.C. App.). Its principle functions are authorized by title 15, chapter 9, United States Code. The mission of NOAA is to explore, map, and chart the global ocean and its living resources and to manage, use, and conserve those resources; to describe, monitor, and predict conditions in the atmosphere, ocean, Sun, and space environment; to issue warnings against impending destructive natural events; to assess the consequences of inadvertent environmental modification over several scales of time; and to manage and disseminate long-term environmental information.

In addition, NOAA provides satellite observations of the environment by operating a national environmental satellite system; and conducts an integrated program of research and services relating to the oceans and inland waters, the lower and upper atmosphere, space environment, and the Earth to increase understanding of the geophysical environment. NOAA acquires, stores, and disseminates worldwide environmental data through a system of meteorological, oceanographic, geodetic, and seismological data centers.

## Land Info. System Summary

NOAA has supported and continues to support approaches designed to provide improvements in existing methods of land surveying and mapping. The basic principle advocated by NOAA has been that land surveys should be adequately tied to and become part of the National Geodetic Reference System (NGRS). The major reason for the needed improvements in existing methods is that requirements are increasing for greater accuracy and reliability. Accurate land surveying can make major contributions to activities such as the design of facilities, the monitoring of pollution activities, land use planning, and the development of multipurpose land information systems.

NOAA has the responsibility to provide the NGRS framework for the entire country. Recent introduction of new technology, such as the Global Positioning System (GPS), the implementation of the North American Datum of 1983, and the planned North American Vertical Datum of 1988, constitute a large range of responsibilities.

The major collecting, storing, and disseminating activity of NOAA related to the land is the collection of geodetic surveys. Considerable effort has been expended by NOAA in coordinating with other Federal agencies in regard to geodetic and related surveys. This is an obligatory activity, required by Office of Management and Budget Circular A-16. It is the mechanism to provide interaction and exchange knowledge among the Federal agencies about ongoing efforts in the geodetic arena.

The Federal Geodetic Control Committee (FGCC) was organized to assist the Department of Commerce in meeting the requirements of OMB Circular A-16 to coordinate geodetic and related survey activities, thereby avoiding duplication of effort. The FGCC consists of representatives from eleven departments and independent agencies that have geodetic and related survey activities and interests. It develops and publishes standards, specifications, and input instructions for producers and users of geodetic control and related surveys.

Due to a lack of resources, activities to date consist of pilot projects with states, counties, cities and other Federal agencies to improve their capability for providing a geodetic reference system for multipurpose use. The approach that NOAA has used for the pilot projects, that are ongoing in several parishes in Louisiana and several counties in South Carolina, is basically the model recommended by the "Need for Multipurpose Cadastre" published by the National Academy of Sciences.

## Organization

*National Oceanic & Atmospheric Administration (NOAA)*  
(continued)

## Organizational Background

*National Technical Information Service (NTIS)*

The National Technical Information Service (NTIS) is the central source for the public sale of U.S. Government-sponsored research, development, and engineering reports, as well as foreign technical reports and other analyses prepared by national and local government agencies, their contractors or grantees. It is the central source for Federally-generated machine-processible data files, and manages the Federal Software Center for intragovernmental distribution.

*National Institute of Standards and Technology (NIST)*

The National Institute of Standards and Technology (NIST)—formerly the National Bureau of Standards—was established by act of March 3, 1901 (15 U.S.C. 271). The Institute's overall goal is to strengthen and advance the Nation's science and technology and to facilitate their use for public benefit. As a nonregulatory agency, the NIST is the only Federal laboratory with the explicit goal of serving U.S. industry and science. To this end, the NIST conducts research providing groundwork for the Nation's physical and technical measurement systems as well as scientific and technological services for industry and government. NIST activities offer a technical basis for increasing productivity and innovation, promoting international competitiveness in American industry, ensuring U.S. involvement in domestic and international product standardization activities, maintaining equity in trade, and promoting public safety.

## Land Info. System Summary

The experience has been that there is a considerable need for better information on the nature of what to do and how to go about doing it. This is one of the reasons that the FGCC is now in the process of writing a guidebook for development of multipurpose land information systems. This guidebook is designed to provide a very detailed approach to advise states, counties, cities, and other political subdivisions with the best information available, based on this research. The major expected benefit from having a guidebook of this nature is that, although everyone will not follow it to the letter, they will still have the information to put into action those things that they can and want to do. Otherwise the result could be that 3,000 counties could have 3,000 different approaches to multipurpose land information systems.

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## Organization

### U. S. Department of Justice (DOJ)

## Organizational Background

The Department of Justice was established by act of June 22, 1870 (28 U.S.C. 501, 503), with the Attorney General as its head. Prior to 1870 the Attorney General was a member of the President's Cabinet, but not the head of a department, the office having been created under authority of act of September 24, 1789, as amended (28 U.S.C. 503). As the largest law firm in the Nation, the Department of Justice serves as counsel for its citizens. It represents them in enforcing the law in the public interest. The Department plays the key role in protection against criminals and subversion, in ensuring healthy competition of business in our free enterprise system, in safeguarding the consumer, and in enforcing drug, immigration, and naturalization laws.

### Department of Defense (DOD)

#### *Corps of Engineers*

The Commanding General, United States Army Corps of Engineers, serves as the Army's Real Property Manager, performing the full cycle of real property activities (requirements, programming, acquisition, operation, maintenance, and disposal); manages and executes engineering, construction, and real estate programs for the Army and the United States Air Force; and performs research and development in support of these programs. He manages and executes Civil Works Programs. These programs include research and development, planning, design, construction, operation and maintenance, and real estate activities related to rivers, harbors, and waterways; administration of laws for protection and preservation of navigable waters and related resources such as wetlands. He also assists in recovery from natural disasters.

## Land Info. System Summary

The Land and Natural Resources Division represents the United States in litigation involving public lands and natural resources, environmental quality, Indian lands and claims, and wildlife resources. The fastest growing area of responsibility involves civil and criminal enforcement of environmental statutes. Although the cases filed by the Division in the area of hazardous chemical wastes are the most visible and complex, enforcement of the clean air and water laws is also a prominent part of the docket.

Although frequently involved in litigation concerning real property, and as a result pleadings may reference legal and physical aspects of land, they do not keep land records per se.

\* \* \*

The U.S. Army Corps of Engineers has formed an Ad-Hoc Geographic Information Systems (GIS) Working Group as a result of a recommendation made by the Corps of Engineers Environmental Advisory Board to the Chief of Engineers, and is tasked to identify key GIS issues and activities related to the missions of the U.S. Army Corps of Engineers. The Group is addressing eight technical areas identified by the Environmental Advisory Board: (1) Sensitivity to User Needs; (2) Scoping (data requirements/applications); (3) Intermodal Hardware Consistency; (4) Software Compatibility; (5) Quality Control and Data Quality; (6) Technology Transfer; (7) Cost Considerations; and (8) Inter- & intra-agency Coordination.

The Corps is involved in a variety of engineering and planning roles, including providing civil works support for the United States, environmental assessments for military installations, and terrain and environmental analysis functions for the field Army.

## Organization

### *U. S. Army Engineer Topographic Laboratories (USAETL)*

## Organizational Background

The U.S. Army Engineer Topographic Laboratories (USAETL) is the center for research and development of topographic equipment and techniques needed to support soldiers in the field. Vast amounts of geographic information are needed because knowledge of the terrain is essential when planning or executing any offensive or defensive military maneuver.

## Land Info. System Summary

Geographic Information systems (GIS) technology enables the Army to create multiple, special-purpose digital or paper map products from a single data base, to enhance standard digital data bases with application-specific information, or to update data bases to support battlefield operations. GIS technology is integral to the Army's plans to exploit digital terrain data. GIS's will be used quickly and economically create the decision-support products used in planning or executing military operations. USAETL has two ongoing projects dedicated to exploring important research issues concerning GIS technology. The first project, the Army GIS Evaluation (AGE), seeks to define GIS performance criteria for various Army applications. The second project, Soldier to GIS Interface Research (SGIR), studies human factors for operation of GIS's by Army terrain analysts. A GIS research team at USAETL has initiated work on the AGE and SGIR projects. The completion of these two projects will be very beneficial to the Army. AGE will enable the Army to select and procure the best GIS solution for a particular application. Implementing advance user interface technology (which promotes simplicity of operations) will make interaction with the GIS notably easier. The deployment of GIS's in the Army will enable soldiers in the field to perform their jobs more quickly and efficiently.

### *Defense Mapping Agency (DMA)*

The Defense Mapping Agency (DMA) was established in 1972, when mapping, charting, and geodesy functions of the Defense Community were combined into this joint DOD agency. DMA is under the direction, authority, and control of the Under Secretary of Defense for Acquisition and the Assistant Secretary of Defense (Command, Control, Communications and Intelligence). The mission of the DMA is to enhance national security and support the Nation's strategy of deterrence by producing and distributing to the Joint Chiefs of Staff, Unified and Specified Commands, Military Departments and other Department of Defense users, complete, credible, and effective mapping, charting, and geodetic products, services, and training at the right place, in the right quantity, and at the right time; ensure that U.S. war-fighting forces have available to them effective mapping, charting, and geodetic support should the strategy of deterrence fail; provide nautical charts and marine navigational data to the U.S. merchant marine and U.S. flag carriers; and maintain liaison with civil agencies and other national and international scientific and operational organizations engaged in mapping, charting, and geodetic activities.





*Appendix F*

**Public Comments**



OFFICE OF THE MARICOPA COUNTY RECORDER

103 County Administration Building, 111 South Third Avenue, Phoenix, Arizona 85003

HELEN PURCELL, RECORDER  
WILLIAM S. THOMPSON, CHIEF DEPUTY RECORDER



242-3545

Mr. Moeller  
Page 2  
July 27, 1989

In our country, with over 3,000,000 population, imputing information would be extremely difficult due to the magnitude of the project.

We hope our comments will be of value to you.

Sincerely,

Helen Purcell

HP/pd

July 27, 1989

John Moeller  
Acting Assistant Director, Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Mr. Moeller,

Our office has been asked to comment on the Executive Summary of the LIS study. While we feel that we would need more detailed information to further analyze the proposed recommendations, the summary does raise some questions in our minds. More specifically:

1. At what level of government will the land information needed be obtained?
2. Who will maintain the central land information system?
3. How will the funding be obtained for the necessary conversion of a system and personnel to accomplish the task?
4. Who will properly train the personnel?

Below is a very general outline of how land information systems function in our county:

1. Land documents are received from our office, either in person or by mail.
2. By statute, we are required to make these documents a matter of public record. We keep an index by Grantee/Grantor names. This index is currently on microfiche.
3. We film all original documents on 16mm roll film (the original documents are mailed back to the requesting party).
4. Our microfiche and our roll film are available upon request for a nominal fee to any party that wishes to purchase these records.

**BOLTON & MENK, INC.**  
CONSULTING ENGINEERS

MANKATO, MN • FAIRMONT, MN • SLEEPY EYE, MN  
AMES, IA • MINNEAPOLIS, MN



United States Department of the Interior

BUREAU OF MINES  
2101 E STREET, NW  
WASHINGTON, D.C. 20241

July 31, 1989

July 28, 1989

United States Department of the Interior  
Bureau of Land Management  
Washington, D.C. 20240

ATTN: John Moeller

Dear Mr. Moeller:

I have reviewed the "Initial Draft" of the Executive Summary of the Land Information Study as requested.

The executive summary is a "Broad Brush" report that covers, in general, what is desirable for a uniform national land information system.

The report contains good goals and provides an overview of the items that need to be considered in developing a land information system.

In reading the report I have not discovered any major oversights that have been left out of the proposed system.

I do note the use of the term "decision makers" in a few instances. Although it is true that land information is used by decision makers it is also used by others and perhaps a broader term such as "users" might be appropriate in those instances.

I commend you on a good start on a big problem.

Sincerely,

Martin C. Menk  
Chairman

MCM:ml

D:\MARTIN\MCM

Memorandum

To: John Moeller, Acting Assistant Director, Support Services, Bureau of Land Management, Washington, D.C.

From: Program Manager, Inventory of Land Use Restraints Program

Subject: Initial Draft of Executive Summary of Land Information Study

This is in response to your July 14, 1989, letter requesting our review of the Initial Draft of the Executive Summary of the Land Information Study mandated by Section 8 of Public Law 100-409. The subject document adequately addresses the topics cited in Public Law 100-409 and the comments we provided Mr. Clifton Fry, Special Project Advisor, National Mapping Division, U.S. Geological Survey on May 26, 1989, relative to this subject.

I would like to compliment you and those working with you on a job well done. The final document should prove to be valuable to the Secretary of the Interior, Congress, and those concerned with Federal land information.

*Ronald D. Bateqik*  
For  
Donald Barnes

# ACSM

American Congress on Surveying and Mapping  
210 Little Falls Street □ Falls Church, Virginia 22046  
(703) 241-2446

JUL 26 1989

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
Bureau of Land Management (840)  
18th and C Streets, N.W.  
Main Interior Building - Rm. 5622  
Washington, D.C. 20240

Dear John:

This letter is in response to your July 14, 1989 letter requesting comments on the "Initial Draft" of the Executive Summary of the Land Information Study (LIS).

Following are a few comments on the draft Executive Summary which I hope will be helpful:

- o I concur that greater emphasis needs to be placed on coordination with State and local governments to share useful information, common data sources, standards, multi-state integration of data, etc.
- o There is much emphasis placed on "the parcel" - Not that I disagree with the importance of parcel level data, I just believe it is over emphasized.
- o Benefit/Cost Analysis - This section is weak and off the subject of LIS; I think it would be better to admit the study did not include a benefit cost analysis.
- o Coordination - What LIS activities are not assigned to anyone at this time? They should be identified.
- o LIS Coordination - The study discusses the FICDC; should there also be a reference to OMB Circular A-16? Several of the previous studies recommend that A-16 be revised.  
Because of changes in technology and relationships among the Federal Mapping, Charting and Geodesy (MC&G) community, it may no longer be feasible to consolidate all mapping, charting, geodesy, surveying, and multipurpose cadastre functions; however, some consolidation among mapping, geodesy, and surveying may warrant further study. Would a united organization structure enhance coordination?
- o OMB Circular A-16 (Coordination of surveying and mapping activities), last revised in May 1967, should be reviewed and revised to reflect:

Mr. John Moeller

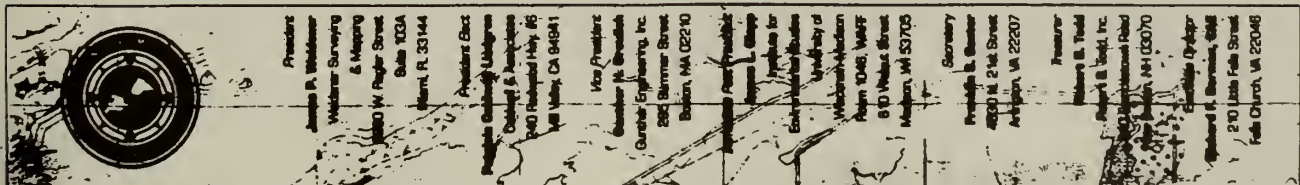
- Federal activities relating to digital spatial data.
- All appropriate agencies are included under the circular.
- The current missions of these agencies.
- An identified linkage to State and local governments to solicit, prioritize, and coordinate their surveying and mapping needs.

I am looking forward to receiving a draft copy of the entire report.

Sincerely,

Franklin S. Baxter  
Director, American Congress on  
Surveying and Mapping

cc: James P. Meidener,  
ACSM President



July 26, 1989

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
U.S. Department of Interior  
Bureau of Land Management  
18th and C. Street, N.W.  
Main Interior Building-Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller,

My comments and suggestions for the "Initial Draft" of the Land Information Study are as follows:

I believe that the "Study Approach" discussed in the third paragraph on page 1 should include as a topic new advances in Land Information Systems (LIS) and Geographic Information Systems (GIS). These new advances would include computer hardware and software developments which facilitate the standardization of databases.

Under the paragraph entitled "Background" on page 1, I feel more emphasis should be put on the digital nature of most land records. The USGS DIG files are currently much more in demand than the traditional paper maps. At SPOT Image Corporation, digital images of the Earth make up more than 70% of our sales while the paper pictures are in much lesser demand. Utility companies work with digitized land parcels in many cases for ease in map generation and production. Numerous examples could be cited but the point should be made that land information in its digital form is in demand and will be the preferred format in the future as well as in the present.

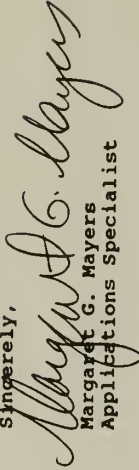
In paragraph 6 on page one, the "method of record keeping" is not an adequate phrase for the problem. The problem is "different formats". The data could be more than adequate for a user, but the format it is presented in does not match his data base. Record keeping implies data collection where as format implies data presentation.

Paragraph 8 on page 2 discusses the importance of location and description of the land if it is to be well managed. This needs to be emphasized more throughout the summary. Most of the Executive Summary talks about the parcel boundaries but little is said about the parcel attributes. The attributes or characteristics of the parcel is what allows someone to manage them, not the legal boundaries.

Throughout the entire summary, too much emphasis was put on the government sector and often the private sector was not mentioned. In paragraph 7 on page 3, it is stated "the private sector plays a dual role as builder and user of an LIS". What also needs to be mentioned is that the private sector also UPDATES land information system information. Many private mapping companies are contracted to update available government land information. The USGS offers maps of the entire US in a variety of forms. However, many of these maps are out of date as soon as they are published because of the rapid pace of urbanization in the US.

The comments above are the most important comments I had after reading the initial draft of the Land Information Study. If you have any questions regarding my comments, please feel free to contact me.

Sincerely,

  
Margaret G. Mayers  
Applications Specialist



(703) 534-0617

# American Society for Photogrammetry and Remote Sensing

210 LITTLE FALLS STREET  
FALLS CHURCH, VIRGINIA 22046-4398

scandals and failures in the savings and loan industry can, in part, be blamed on the current difficulties of administrators obtaining reliable and complete information on the properties involved. Last year the National Park Service reportedly paid \$800,000 for a piece of property they already owned, as another example.

With the advent of the computer age, the technical problems of acquiring and presenting accurate land information have to be addressed and solved. I wish you the best of luck and trust that the ASPRS has and will continue to do its part.

*Alden P. Colvocoresses*  
Alden P. Colvocoresses

## Memorandum

To: John Moeller, Bureau of Land Management, Department of the Interior  
From: Alden P. Colvocoresses, Past President  
American Society for Photogrammetry and Remote Sensing (ASPRS))  
Subject: Comments on the "Initial Draft" of the Executive Summary of the Land Information Study (LIS) (July 14, 1989)

July 27, 1989

This draft is an excellent summary of what promises to be a very important report. As you know, it will be the latest of a long list of previous reports on the same subject which have accomplished little. To improve the acceptance of this report, I suggest that this study be kept in the technical domain and not imply that its recommendations are going to solve our LIS problems. The aim is to provide the needed information which does not necessarily mean that the "right" decisions will be made. Therefore, I suggest the following:

1. Page 2, third paragraph right side (copy attached).  
Management of the land and its resources calls for information .....  
Since land management requires .....  
(Note that I have left out well managed or proper management. These terms imply we know how best to manage land. What's right for one person is wrong for another. The actual management decisions will be made by the lawmakers -- not a commission as could be inferred by the existing wording).
2. Your description of previous studies is weak. This problem goes back to the Hoover reports of the 20's and 30's and was almost acted on by Nixon in the 70's when he tried to create a Department of Natural Resources. Even in the summary, this (U.S.) history deserves better coverage.
3. Why is foreign practices and experiences ignored? Twenty years ago one of the leading mapmakers in Europe remarked that only a nation as wealthy as the United States could afford such a haphazard system of property description as we have. At least a few sentences on how others have tackled these problems is in order.
4. Your study will be of very limited value unless it gets broad dissemination. The Executive Summary should get to the popular press (Time, New York Times, Washington Post, etc). This calls for some good public relations on your part which I hope will be forthcoming. On trying to get public exposure (press coverage) of this matter, I believe it can be related to several events of current public interest. The recent HUD

## Attachment

cc: James Clapp w/attach  
Roger Hoffer w/attach  
Cliff Fry w/attach



August 7, 1989

TO: Pet Korp

Generally the report on Land Information provides a useful statement about needed improvements in the nation's land information systems.

A few minor comments:

p.9. The opening quote from Parade magazine "Use of dubious accuracy. Even if not actually wrong, the primary source, not a news magazine, should be cited in a report of this kind. If the original source cannot be identified, drop it."

p.9. and p. 25. The number of governments maintaining land records (at least in the sense used in the report) is such smaller than 83216. School districts may have georeferenced households and pupils, for example, but they are not governments that "maintain land records."

p.12. Parcel Identifiers. Somewhere in the text the distinction between a parcel number with descriptive information and a parcel locator should be made. To save space here let me simply refer to Hartmut Ziemann, Land Unit Identification, Natl Research Council of Canada, NRC 15736, Dec 1976, for the arguments. The item as it now stands is not so much wrong as incomplete, and possibly misleading. I can help on the subject if you wish.

p.20. Under monitoring Foreign Ownership... item 1. Following the word representative: (Congress selected this option by passing PL 94-460, the Agricultural Foreign Investment Disclosure Act, which requires foreign owners of farm or forest land to register with the Secretary of Agriculture.)

p.25. The Economic Research Service has a substantial amount of land data, including some lengthy time series on use, value, and ownership. The agency has a listing, including an "expert system" diskette to guide PC users on types of data available and means for accessing them.

p.47. To the Benefit/Coast studies you might wish to add in your references, if not in the text, the report by Catherine Long An Evaluation of the Virginia Land Book and Related Records, VPI&SU Information Series 86-4, Oct 1986 based on her Master's thesis; and a Ph.D. dissertation by Tom Blaine A Measurement of the Benefits of Land Information Systems (LIS) Services, Ohio State University, 1986. Blaine will shortly publish a journal article from his dissertation.

Gene Wunderlich

July 24, 1989

SUBJECT: Executive Summary, Study of Land Information Systems

TO: John Mueller

The Bureau of Land Management is to be commended for its efforts to bring together the diverse concerns and interests related to land information. I have two editorial suggestions, and one comment on recommendations.

On page 2, first full paragraph: Delete the reference to Parade Magazine; it is not authoritative for a report of this stature. Furthermore, if not incorrect, it is at least misleading. The area of land, if not the asset value, is quite accurately determined by a requirement for all foreign persons to report on a form ASCS 153 all agricultural (farm, ranch, timber) land owned by them. An annual report to Congress summarizes data from these reports to the Secretary of Agriculture on 12.5 million acres of foreign held land.

On page 2, top of second column: Enter a reference for the quotation in italics.

On Recommendations: Within the framework of the Commission, create a relationship to a semi-autonomous institution whose mission is to allow open, uncommitted debate of technical, organizational, and political issues. Purpose of the institution would be to promote free discussion of problems, ideas, and opinions among diverse interest groups. The institution membership would be decided by participating organizations, without regard to criteria used to determine Commission membership. Coordination and integration of standards and official liaison with agencies would rest with the Commission.

I am making these comments as an individual with over two decades of involvement in land information systems. Any official comment from Economic Research Service will be transmitted via Agriculture's representative, Don Engleton.

Gene Wunderlich

GENE WUNDERLICH



STEVEN L. POLLOCK  
DIRECTOR

PETER S. HEWES  
COUNCIL

RENE L. KOOPER  
SECRETARY



OCEAN COUNTY PLANNING BOARD  
COURT HOUSE SQUARE  
C.H. 2181

Toms River, New Jersey 08754-2191  
Telephone (201) 979-2054  
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July 31, 1989

MEMBERS

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RICK MASSIMIANO

Mr. John Moeller, Acting Assistant Director  
Support Services  
United State Department of the Interior  
Bureau of Land Management (840)  
18th and C Street NW  
Main Interior Building, Room 5622  
Washington, DC 20240

Re: Executive Summary of the Land Information Study

Dear Mr. Moeller:

Thank you for forwarding to my attention a draft of the above referenced report. The County had previously completed a survey on this matter at the request of the National Association of Counties. Many of the comments that I expressed in our survey response are reflected in the draft report.

There is an area of concern that I think perhaps should be more stressed relating to the cost of developing the land use data base. As I am sure you are aware the computerization of the geographical information represents a major cost of such land use management systems and as your report correctly states is a public asset when completed. When this work is completed by a public agency the data is subsequently public information and must be made available upon request. My concern is how government apportions a fair cost for this data. For example, the County has recently completed a GIS mapping of all of the public water systems within its jurisdiction. Almost immediately I received a request from a consulting firm under contract to the State for a copy of the GIS file. Once the consultant has electronically stored this data it then becomes an asset of his firm which he can use for profit. I think that further investigation needs to be done on an equitable means of sharing data between the public and private sectors and placing limits on the use of data by the private sector when that data is generated at public expense.

Again I appreciate the opportunity to review your draft report. If you have any questions with regard to this letter or the County's survey response, please do not hesitate to contact me.

Very truly yours,

Alan W. Avery, Jr.  
Assistant Planning Director

AMA:sa  
cc: H. George Buckwald, Freeholder

Department of Civil and  
Construction Engineering  
Ames, Iowa 50011-3232  
Telephone: 515-294-2140

IOWA STATE  
UNIVERSITY

July 25, 1989

Mr. John Moller, Acting Assistant Director, Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

I have reviewed the "Draft Executive Summary" of "A Study of Land Information Systems" dated 7/14/89 and recently released by your agency. It is my opinion it represents current majority attitudes toward land information systems while not overlooking the many associated problems to be resolved.

The success of land information systems would seem to be user driven and users are potentially a very diverse lot. It would concern me to create a new federal agency charged only with working on the needs mentioned in the summary with the attendant danger of inadequate input from existing agencies with strong surveying, mapping and land information needs. Perhaps the coordination group could be modeled along the same pattern as the Federal Geodetic Control Committee.

Sincerely yours,  
  
Donald K. Wall, Assistant  
Professor



UTAH COUNTY  
County Recorder

500 B. Road, Recorder

MAIL ROOM  
Name Plate  
Phone Calls Book  
Phone Sign

August 1, 1989

U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Friends:

I attended the last annual NACO conference held in Cincinnati, Ohio, and was given a copy of a letter from John P. Thomas, Executive Director of that association, regarding the development of what was referred to as "very important national public policy." Included with that letter was a letter from John Moeller, Acting Assistant Director, Support Services, United States Department of the Interior, Bureau of Land Management, Washington, D.C., regarding Section 8 of Public Law 100-409 which had been referenced in Mr. Thomas letter, as well.

As Chair of the National Association of County Recorders and Clerks' (NACRC) Land Records Committee, I gave a presentation at the first meeting concerning the requested report to Congress that was held by NACO and the Bureau of Land Management in Washington D.C. earlier this year. In it I noted that local land information systems have been and are being designed and developed using latest state of the art software and hardware, reflecting excellent multipurpose concepts, and that sharing of data now is possible and economically feasible, with transferable tapes and modems available that interface with most automated systems. There is no doubt, however, that in some parts of the Country, modernization is yet to be considered or accomplished.

As local recording officers have discussed LIS, GIS, etc., there is general agreement that recommended procedures and standards may be desirable, but we have found through many years of experience that there is a distinct difference between recommended procedures and regulatory controls which so often occur when Federal funds are expended for locally administered programs. When funding is not extended along with regulations, those jurisdictions often find themselves in a position of not having the resources to deal with the mandates. Nevertheless, the proposal for the need of standards and coordination is not unreasonable.

However, the last paragraph of the draft submitted indicated there was another option that is still being considered that was recommended from a 1981 National Research Council study which called for a single agency, a Federal surveying and mapping administration, for civilian mapping, charting, geodesy, surveying and the multipurpose cadastre. It appears that it is still being recommended that the Commission recommended by this report examine and consider ways to manage surveying and mapping functions, looking at all the ramifications, and the feasibility of creating such an agency. I cannot speak for the NACRC Land Records Committee members, because we have not had an opportunity of meeting since this draft was given us, but from a local land information manager's perspective, I can only submit a caveat that is a result of working with local government as it relates to Federal involvement. I have yet to see a Federal program that is more efficient than those developed, operated and controlled by a local agency. In addition, again, recommendations and certain basic standards may be advisable, but, in my opinion, design, development, administration and adoption of standards should remain the prerogative of local government.

Very truly yours,

UTAH COUNTY RECORDER &  
NACRC LAND RECORDS COMMITTEE

  
Nina S. Reid, Recorder &  
Chair  
NACRC Land Records Committee

NBR

C.C. John P. Thomas, NACO Executive Director  
John Moeller, Acting Assistant Director  
Support Services, BLM  
NACRC Land Records Committee Members

c/o Gunther Engineering, Inc.  
285 Summer Street  
Boston, Massachusetts 02210  
August 3rd, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W.  
Main Interior Bldg. - Room 5622  
Washington, D.C. 20240

ATTENTION: Mr. John Moeller, Acting Assistant Director  
Support Services

REFERENCE: A Study of Land Information Systems

Gentlemen:

I have received and reviewed your Draft Executive Summary of your study of Land Information Systems in compliance with Section 8 of Public Law 100-409. I have been asked by the President of the American Congress on Surveying & Mapping to submit my comments to you. Unfortunately, the complete report arrived only yesterday at my office. In order to meet your deadline of August 4th, I had little time to study it. Nevertheless, my comments on your summary are as follows:

1) COORDINATION AND ROLES/RESPONSIBILITIES

The draft is correct to consider the "State role" in LIS "a key link". Here's where the action is. However, the fact that we have so many states in the union and that within each state there are so many agencies dealing with the land (see Wisconsin study of several years ago), the federal government must assume the leadership responsibility. Standards and guidance must come from a central source. States are usually eager to adopt reasonable standards that have emanated from Washington. Geodetic control in inter-state highway construction was one example.

Again, the draft is correct suggesting that "the needs of other jurisdictions" must be considered. This is particularly true for private utility companies. They too are looking for guidance and help.

(CONTINUED PAGE TWO)



President  
James L. Clapp  
Institute for  
Environmental Studies  
University of  
Wisconsin-Madison  
Room 1046, VAMF  
810 Walnut Street  
Madison, WI 53713

President Elect  
James P. Weidauer  
Wilderness Surveying  
& Mapping  
6380 W. Flagler Street  
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Miami, FL 33144

Vice President  
Pierluigi Calabrese Undergran  
290 Redwood Hwy. #6  
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4071 Worcester Road  
Ferryman, MD 91701

Executive Director  
Richard F. Durkin  
210 Little Falls Street  
Falls Church, VA 22046

The "private sector" works with and creates building blocks of a land information system every day of the week all across the country. It is, however, done on a site specific basis without real concern or ability to consider the whole. There usually is neither the time nor the conviction on the private side to worry about the entire system. Money, however, is being spent anyway, and with some standards and guidance, it could be channelled in the right direction and be a true contribution to the multipurpose land information system for the good of the country. The taxpayer at the local level would benefit greatly if, for instance, filing of boundary plans be made mandatory in every state and county of the country. These plans, however, need to be prepared on the basis of uniform standards, which only, I believe, the federal government can coordinate.

2) GUIDELINES/STANDARDS

While the vast majority of federally owned real estate is within the rectangular public land survey system, quite a bit of land is also within the metes and bounds state, not to mention metes and bounds subdivisions occurring within the rectangular system. I agree with the suggestion that existing standata be adapted and utilized as much as possible in order not to reinvent the proverbial wheel. The Massachusetts Land Court Engineering Department, for instance, has published such standards throughout this century. I would recommend that the committee look at them.

The managerial coordination of land information should be accompanied by mathematical coordination. In order to truly provide for "maximum data exchangeability", an official coordinate system for each state or county, such as the State Plane Coordinate System, must be adopted.

3) FUNDING

Again, incentives for sharing data between the private sector, utilities, etc. is desirable but possible only if the work being done now is executed in the form of a building block with a future LIS in mind.

4) Your final recommendation to designate "an individual organization at state and local levels of government" is proper and desirable. Whatever agency it may be, however, must be strongly rooted in knowledge of land surveying, geodetic control and their mathematical relationship to good record-keeping.

(CONTINUED PAGE THREE)

Telephone 444-3511  
Fax 444-8034

E. R. Brownell & Associates, Inc.  
Engineers - Land Surveyors

3158 Canal Way  
Miami, Florida 33145

July 31, 1989

Mr. James P. Weidener, PLS  
Weidener Surveying & Mapping  
8360 W. Flagler Street, Suite 103A  
Miami, Florida 33144

Dear Jim:

In reply to your recent request for input regarding the Federal Land Information Study, I suggest several items for consideration.

Under "Land Information Management" emphasis is on governmental management and government information. The private use I think, is underplayed. Private parcels are not mentioned although all land is within some legal jurisdiction. Since this is the case, why single this out in the definition of LIS.

Other related uses such as fire fighting, police work, appraising, etc., could be mentioned as uses.

Under "coordination" it may be possible to relegate some of the LIS coordination work to colleges by assisting them with grants to explore the furtherance of attaining a system of linked LIS.

Sincerely,

E. R. BROWNELL & ASSOCIATES, INC.

*E. R. Brownell*  
E. R. Brownell, PLS  
President

ERB/pw

cc: U.S. Dept. of Interior

Enclosure

# ACSM

American Congress on Surveying and Mapping  
210 Little Falls Street □ Falls Church, Virginia 22046  
(703) 241-2446

Bureau of Land Management  
August 3rd, 1989  
PAGE THREE

The feasibility of creating a "single agency" on the federal level would have to consider the pros and cons of the advantages of a central information source and the danger of over-centralization. It appears to me that the FGCC has worked very well in the past. Why not make the FGCC or a branch of it the organization to oversee and create standards for LIS in the nation?

I hope my comments are helpful to you. On behalf of ACSM I wish you the best of luck in succeeding. Whether we know it or not, a Land Information System that is truly a "system" is badly needed in this country.

Very truly yours,

*Jim Greulich*  
Jim Greulich, PE, PLS  
Vice President, ACSM

GC/k

c.c. J. Weidener, President ACSM




- President  
James L. Chapp  
Institute for  
Environmental Studies  
University of  
Michigan-Michigan  
Ann Arbor, MI 48106
- Vice President  
James P. Weidener  
Weidener Surveying  
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- Immediate Past President  
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- Secretary  
Stephen A. Taylor  
219 Blaine Dam Drive  
Baltimore, MD 21801
- Treasurer  
Richard W. Foster  
Brownell & Associates, Inc.  
210 Little Falls Street  
Falls Church, VA 22046

4026 E. Campbell  
Phoenix, AZ, 85018  
July 29, 1989

MILLER

I will be looking forward to seeing the full report. Thank you for considering my comments.

Sincerely,  
  
Michael Miller, P.L.S.  
Survey Engineer  
City of Phoenix  
Past President, Arizona  
Professional Land  
Surveyors.

U.S. Department of Interior  
Bureau of Land Management  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Subject: Draft Executive Summary, A Study of Land Information Systems.

I feel that your Draft Executive Summary addresses the relevant issues in connection with Land Information Systems. I believe several issues should be further emphasized.

I believe the need for geodetic control should be heavily emphasized for the development of any LIS system. As the report points out, "Since proper management requires an accurate description of location, a reference framework that is tied to monumented geodetic control points is essential."

On the local level, I am seeing many LIS systems being developed using maps and information that is not tied directly to any reference framework. Information is digitized or scanned electronically into the system. These systems are creating confusion and extensive problems for the users since no accurate reference framework exists. As conflicting information is added to the system, users cannot determine what information is correct or how to resolve the problems. In order to make these systems work, incredible amounts of resources are being spent to develop and implement a proper coordinate based geodetic system.

I believe the base geodetic control should be heavily emphasized in this report. Perhaps some examples of the problems encountered without this geodetic base would emphasize the importance of this base.

I hope plans are being made to widely distribute this report to local governments. Most local governments are looking at LIS. The power and advantages of these systems can be easily sold to governments. Once the concept is approved, agencies are buying systems that spend their resources without building a solid base for their system. Once the resources are spent, users are left to deal with the problems created by inadequate planning. If this report is widely distributed to local agencies and governments, I believe it will help create a solid plan for these agencies to get into LIS.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL GEODETIC SURVEY  
610 Walnut Street  
Madison, Wisconsin 53705

1 August 1989

Mr. John Moeller  
5622 U.S. Department of the Interior  
Bureau of Land Management  
18th & C St. NW  
Washington, D.C. 20240

Dear John:

This letter is to transmit my review comments on the July 14, 1989 Draft Executive Summary of "A Study of Land Information Systems".

In general, the Summary reads well, and with a few exceptions I note below, does a good job of laying out the need for and recommended ways to improve the nation's LIS.

One concern I have regards reviewing the Summary without having access to the final draft of the report itself. Therefore, I hope we have an opportunity later to fine-tune the Summary, to be sure it conforms to and agrees with the full report. I assume you will handle most of the inter report coordination without further input from us.

A number of specific comments are included on the copy of the Summary I am returning to you. A few additional or expanded comments are noted below.

Page 2 Paragraph 2 I question the conclusion in this paragraph as to the lack of information on foreign land ownership in the U.S. The USDA, through the AFIDA program enacted by Congress, monitors purchases and sales of U.S. land by foreigners, at a cost of over \$300,000 per year. USDA defines agricultural land so as to include 95% of the U.S. land area. (Call J. Peter DeBraal, at ((202)) 786-1425 for more details).

Page 2 Paragraph 1 (At top of column 2). It does seem to me that "administrative, legal, and parcel" data are not exclusive categories.

Page 3 Paragraph 1 I question how need is "driving major new technology advances". Do we have examples in full report?



Page 4 Paragraph 2 (At top of column 2). I disagree that "value of information" is necessarily increased by increase in amount of data. Suggest adding qualifier.

Page 4 Paragraph 2 (at top of page). Information is also perceived as property by many people.

Page 4 Paragraph 4 (At bottom of page). I suggest adding NGS to the list of federal agencies that have done economic analyses.

Page 6 Paragraph 3 (Last paragraph). This is very wishy-washy, but may be the best that can be done, given the context of study, etc.

I am looking forward to seeing the full final report.

Sincerely,

D. David Moyer  
State Advisor  
Multipurpose Land Information and  
Geodetic Systems

DDM/cdw

cc: J.L. Clepp  
Gilbert J. Mitchell

Lewis A. Lapine  
19120 Mt. Airy Road  
Brookeville, MD. 20833

August 4, 1989

John Moeller  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller;

I was asked by the American Congress on Surveying and Mapping (ACSM) to review the Initial Draft of the Executive Summary of the Land Information Study (LIS). My comments have been supplemented by Walter M. Winn. Both Walt and I are employed by the National Oceanic and Atmospheric Administration and are currently assigned to the Nautical Charting Research and Development Laboratory of the Office of Charting and Geodetic Services. Our comments have been discussed with Dr. Charles R. Schwarz who represented NOAA in the LIS. As the President-Elect of the American Association of Geodetic Surveyors, ACSM, I am interested in future revisions to the study.

1. Guidelines/Standards (Page 3) - The first sentence is unclear. I believe the interpretation and reading would be more understandable by adding a colon as follows:

For the purpose of this report, a standard is: a specification, test method, ...

2. Guidelines/Standards (Page 4) - Reference is made to existing standards. Since the LIS spends some time talking about parcels and their importance, a standard for parcels should be included. I suggest you consider the "Standards on Parcel Identification," by the International Association of Assessing Officers, (Chicago, IL).

Second, I suggest the Digital Cartographic Data Standards Task Force be substituted for FICDC because the Task Force was assigned the responsibility of merging the proposals from FICDC's Standards Working Group and ACSM's National Committee for Digital Cartographic Data Standards.

3. Benefit/Cost Analysis (Page 4) - Mention of \$17 billion dollars being spent in 1989 on information technology could be misleading. Perhaps the amount should be justified by civilian versus military spending, and/or data processing; i.e., word processing, versus data basing.

4. Benefit/Cost Analysis (Page 4) - The third paragraph could be amplified by adding the following phrase to the last sentence:

... continue to grow if a rational system, interlinked between Federal agencies, using a common data format compatible with the participating agencies' missions, is designed from the onset.

5. Benefit/Cost Analysis (Page 4) - The fifth paragraph should be amplified by citing sources as in previous paragraphs. Also, one must be careful not to confuse "electronically" with "telecommunications." Not all data bases will be available by direct telecommunications, but logically linked only by digital data transported on a magnetic or optical medium.

6. Benefit/Cost Analysis (Page 4) - In the seventh paragraph strike the phrase "if not impossible." Nothing should be construed as impossible if your effort is to be seen in a positive light. Wisconsin has already performed a cost/benefit analysis and was able to sell a large program to its State government as a result.

7. Recommendations (Page 5) - The lead paragraph could be amplified by adding the following sentences:

"Any and all new data collected should be stored in machine readable format for ease of incorporating into a future Land Information System.

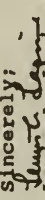
All Federal agencies should begin immediately to implement NAD 83 as a common datum reference frame, to facilitate the building of a common unified data base."

It is my opinion, that it is time for Federal agencies to show how serious they are about Land Information Systems by using their own initiative (and funding if need be) to break away from traditional methodology and local standards.

8. Coordination (Page 6) - Add the following bullet:

The commission should be made up of personnel reassigned from their respective agencies to foster a sense of partnership between the participants, enable the flexibility of transferring the required expertise in and out of the commission as needed and reduce overhead expenses associated with the building of an entirely new federal bureaucracy.

9. Ending paragraph - The third sentence does not make sense. The reference to new technologies could be taken as positive or negative. It sounds like a negative aspect.

Sincerely:  
  
Lewis A. Lapine  
Commander, NOAA



# Salt Lake County

## SURVEYOR'S OFFICE

2001 S State St #N1500  
Salt Lake City, Utah 84190-1350  
(801) 468-2028

**M. Carl Larsen, L.S.**  
County Surveyor

**P. Nick Floros**  
Chief Deputy

August 1, 1989

Mr. John Moeller  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th and C Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear John:

I appreciate the opportunity to review the "initial draft" of the executive summary of the Land Information Study (LIS) mandated by section 8 of Public Law 100-409.

I have only one comment to make, and do so on the basis of being President, for only a short period of time, of the newly formed National Association of County Surveyors (NACS).

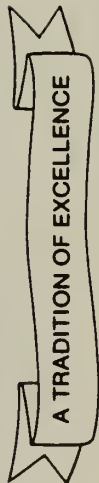
My comment gets right to the heart of LIS and is accurately stated in the summary (since proper management requires an accurate description of location, a reference framework that is tied to monumented geodetic control points, is essential.)

After one or two short meetings with surveyors from across the Nation, especially local government using the Public Land Surveying system, it has become quite obvious, that very little time, money or effort has gone into perpetuating or maintaining the vital PLSS corners that will be needed if a survey accurate data base tied to geodetic control is accomplished and the National LIS system becomes reality.

Sincerely,

M. Carl Larsen, L.S.  
Salt Lake County Surveyor  
President, National Association of County Surveyors

MCL/tpf



## F. HENRY SIPE

LICENSED LAND SURVEYOR & FORESTER  
1404 HARRISON AVE. - ELKINS, W. VA. 26241  
PHONE 304-636-2465

August 3, 1989

U.S. Dept. of Interior,  
Bureau of Land Management (840),  
18th & C Streets, N.W.,  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Attention: Pat Korp,

Re your 1750(840) memo of July 27, 1989.

I spent several hours reading the Initial Draft of the LIS Report.

It appears to be a good report and I agree with its recommendations.


I would like to see a pilot county here in West Virginia - maybe Randolph County - where I live and am the County Surveyor - but no salary attached. Perhaps the Monongahela National Forest, headquartered in Elkins, could take on the project.

F. Henry Sipe

MEMBER  
WEST VIRGINIA ASSOCIATION OF LAND SURVEYORS  
AMERICAN CONGRESS ON SURVEYING AND MAPPING  
SOCIETY OF AMERICAN FORESTERS

- Instrument:
- Adjustment:
- Drafting
- Cartography
- Boundaries:
- Recording
- Collecting
- Retrieval
- Peak
- Surveying





Offices of  
**The Property Appraiser**  
Sarasota County  
Florida

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2001 Adams Lane  
Sarasota, FL 34237  
Phone (813) 951-5656

South County Office:  
4000 So. Tenth Street  
Venice, FL 34293  
(813) 492-3000

August 2, 1989

John W. Mikos, C.F.A.  
Property Appraiser

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Mr. Moeller:

Thank you for giving us the opportunity of input for Land Information Systems. Although Sarasota County is in the initial stages of a Geographic Information System study, we are interested in this comprehensive project. Our office would also be interested in obtaining copies of the final report once completed.

As far as suggestions go, the Property Appraiser's Office would like to see:


1. More educational seminars and information by commission officials on GIS/LIS, and the impact thereof.
2. A federal agency with authority to oversee the adherence to and implementation of standards, and licensing of vendors.
3. A grading system or consumer oriented publication evaluating software packages and vendors which in ever increasing numbers are entering the market.
4. Support staff to assist in the start of a project.
5. A clearing house where most LIS related questions could be directed.

Mr. John Moeller  
August 3, 1989  
Page 2

Our office is currently investigating avenues to approach implementation of a GIS/LIS system. We are bombarded with literature, promotions and other correspondence from the various enterprises specializing in this field. Evaluating which system best suits our needs and has a good track record is becoming a difficult proposition.

If we can be of further assistance, please contact us.  
Very truly yours,

JOHN W. MIKOS, CFA  
Sarasota County Property Appraiser

By   
S. L. Guinhart, Jr., CFE  
Supervisor - Cadastral

CLG:mc



**oregon institute of technology**

U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C Streets, NW  
Main Interior Building - Room 5622  
Washington, D.C. 20240

August 4, 1989

Dear Sirs:

My comments on "Executive Summary" of A Study of Land Information.

1. I believe the study correctly identifies the issues, recognizes the complex inter-relationship of various disciplines and makes recommendations consistent with the need (benefit to society) for better coordination among various organizations and disciplines at numerous levels.
2. I recognize the study deals with the big picture and overall concepts, but I felt two sections need additional attention; 1.) the role of the private sector and 2.) the need for education.
  - A. Private Sector: Given an environment of "privatization" for certain government services, I suggest the private sector can contribute more than just hardware and software as suggested in a single paragraph on page 3. For example, "The Role of Government vs the Private Sector in Geodetic Surveying" was the topic of a session at the Spring 1986 convention of the American Society of Civil Engineers in Seattle, Washington. The papers were reviewed and most of them published in the October, 1986 issue of the ASCE Journal of Surveying Engineering. More discussion is warranted.

- B. Education: Knowing what to do with information and making a proper analysis from given data can be just as (if not more) important than having the information. From an educational perspective, development of appropriate thought processes and keen insight into detail is just as important as understanding the "big picture." Already, our ability to collect meaningful data exceeds our ability to analyze it correctly and use it effectively? More education is needed at many levels.
3. The gap between surveying research and practice is, in many cases, enormous. Implementation of a successful LIS at the local level will be enhanced to the extent appropriate standards are adopted and used. Misguided efforts by well-meaning, but unqualified (and maybe licensed), professionals will be very costly indeed.

Yours truly,

*Earl F. Burkholder*  
Earl F. Burkholder, PLS., PE  
Surveying Curriculum Coordinator

Klamath Falls, Oregon 97601-8801, Phone (503) 882-6321

**HUTCHISON-BIGGS & ASSOCIATES, INC.**

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(704) 258-1065

W.G. Hutchison, R.L.S.  
Richard M. Biggs, R.L.S.

August 1, 1989

Patricia Hutchison, R.L.S.  
W. Edwin Holmes, R.L.S.  
Robert C. Brown, R.L.S.

U.S. Department of Labor  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Attn: Pat Koop

Dear Sir:

Thank you for the opportunity to review the "Initial Draft" of the Executive Summary and the Land Information Study, mandated by Section 8 of Public Law 100-409.

This document is well written, however there are several typographical and grammatical errors, which still need to be corrected. It presents the information required by the Law. The conclusions reached are reasonable.

As noted in Chapter IV, previous studies have identified the problems and made suitable recommendations, but there is still much to be done to bring a unified land information system into existence.

Sincerely,

*Patricia Hutchison*  
M. Patricia Hutchison, RLS

3 August 1989

U. S. Department of the Interior  
Bureau of Land Management (B40)  
18th and C Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Re: Comments and Suggestions on the Initial Draft of the  
Executive Summary of the Land Information Study

Ladies and Gentlemen

In general, I am favorably impressed with the material contained in this summary report. The statements appearing in the first four pages, prior to the section on recommendations, are unfortunately, very true. Even so, I feel compelled to offer comments regarding four statements in these preliminary sections of the report, as follows:

Page 2, Land Information Management, 2nd paragraph

The last sentence discusses capability to "graphically display and plot" data. No mention is made of capability to either directly display or to reference for display written material pertaining thereto. In the case of land use controls, this might be characteristics of particular use zones. In the case of utilities it might be a report on condition of piping. In the case of population it might be summary by age, sex, education, etc. In the case of a road it might be seasonal weight restrictions, or a study relating present traffic use to maximum capacity.

Page 3, Coordination and Roles/Responsibilities, 1st para.

I believe the last segment of the first sentence should be revised to read "and which have not had admitted a need to coordinate in the past."

Page 3, Guidelines/Standards, 3rd paragraph

The first statement in the second sentence reads "For example, there are no standards for legal accuracy of deed descriptions which are filed,...". While I am not sure just what is meant by the term "legal accuracy", I do suffer attacks of fear at the thought of the federal government attempting to standardize the format of conveyance

Page 1 of 3

(Comments on Executive Summary, 3 August 1989, page 2 of 3)

descriptions in all fifty states. The Washington State Supreme Court states: "in order to comply with the statute of frauds, a contract or deed for the conveyance of land must contain a description of the land sufficiently definite to locate it without recourse to oral testimony...", and that "A description by which the property may be identified by a competent surveyor with reasonable certainty, either with or without the aid of extrinsic evidence, is sufficient." While perhaps in ignorance, I have always believed that this type of law exists in the other states. In any event, I believe this constitutes a poor example to use for the need for promulgation of standards, as the standards should speak to multiple use of information. The delineation of parcel boundaries should accommodate the historic conveyance system of each locale.

Page 4, Guidelines/Standards, ultimate paragraph

This paragraph mentions National Map Accuracy Standards and digital cartographic standards, both of which are exemplary for their present purposes, and do not need revision. I believe both will adequately serve a "geographic information system" but because of scale differences modifications will, not may, be necessary to accommodate land information systems.

I also offer the following comments regarding recommendations:

Page 5, Land Information System Concept, 2nd paragraph

Unless they be considered "other land attributes", lack of mention of such things as utilities, census data, and written information as first discussed herein is conspicuous and should be included.

Page 6, Funding, 1st, 2nd and last points marked with 1

As pointed out in the opening remarks of this section, these systems will decrease record keeping costs, not increase them. Therefore the emphasis should be on convincing elected government to dictate cooperation to bureaucratic government to create these systems and effect the desired savings. While cost distribution among LIS users is a reasonable proposition at first glance, it loses credibility when one considers that the primary user is government(s) itself and when one considers the past inclination of government to excuse itself from legal conformance and transfers that cost to private users only, thus making private access to presently available, albeit inconvenient, information prohibitively costly after "improving" the system.

(Comments on Executive Summary, 3 August 1989, page 3 of 3)

Page 6. Coordination. 2nd paragraph. 13, 14, 16

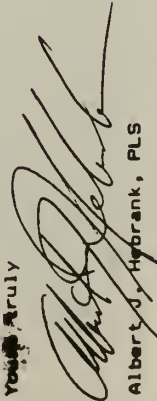
While each of these items at first glance appears proper, one sees in the total another bludgeon effect of federal government upon the state and local communities. I do not believe this to be necessary and feel that while legislation requiring cooperation between federal agencies is probably appropriate, that the objectives for state and local conformance can be accomplished through development of good standards, systems, education and persuasion. Incentive grants coupled with the usual federal reporting requirements could cause an increase in the total bureaucracy and therefore the cost of LIS, which should really result in decreased costs. I believe a "kinder and gentler" approach would be beneficial.

General Comments

I believe that five elements in the specifications for LIS systems should be under constant consideration in the design efforts. They are compatibility between systems; flexibility of input and manipulation; a good mathematical base (which you have stressed); availability of output to all users with input restricted to the users concerned with that particular data; and ready identification of relative accuracy of all spatial data. I also believe that primary input to the systems should be at the local level.

Thank you for your consideration.

Yours Truly



Albert J. Hebrank, PLS

cc: J. Weidener, President ACSM

# HEBRANK AND ASSOCIATES

Albert J. Hebrank, PLS  
Jon P. Warren, PLS

Professional Surveyors  Central Building, Suite 355, 810-3rd Avenue  Seattle, WA 98104  (206)-447-1729

17 August 1989

U. S. Department of the Interior  
Bureau of Land Management (B40)  
18th and C Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Attn: Pat Korp

Re: Comments on "A STUDY OF LAND INFORMATION", 27 July 1989 Draft

Dear Ms. Korp

I am most impressed with this product of the committee, and wish to congratulate all who worked on it for an excellent compilation of information, rational conclusions and recommendations.

My copy of the draft report contains 56 pages, ending at the very bottom of page 56 with 5 #'s under item 2 of Action Plan. Although my comments herein will be negative, this means that I regard those items on which I do not comment in a positive light.

I fully support the establishment of the commission described on pages 54 and 55, but suggest that another primary function of that commission should be to educate and persuade local governments and the public of the virtues of LIS to the extent that participation is desired by them, not forced upon them.

The list of components of all land information systems, unless it be a part of "other land attributes", does not mention utilities and other infrastructure, although it is mentioned in other sections.

On page 45, under "What Needs to Be Done", the statement is made that standards should be implemented in incremental or progressive stages. Will this not lead to incompatibility of systems?

My only major problem with the study relates to the funding issue. The first item 4 on page 17 speaks of Federal grants to counties for 30 to 50 per cent of cost of development meeting federal requirements. A statement is made on page 23 that states may have to increase taxes if these Federal grants are not made. The first item 2 on page 40 speaks of financial incentives, and the call for incentive grants appears again on page 54.



**CALVERT COUNTY  
DEPARTMENT OF PLANNING & ZONING**

Prince Frederick, Maryland 20678  
(301) 535-1600/(301)855-1243 (DC)  
(301) 535-2348

*Board of Commissioners*  
William T. Brown  
Mark B. Frazier, D.D.S.  
John M. Oost, Sr.  
Barbara A. Wilson  
Joyce L. Terles

*Director*  
Frank A. Jaklitch

August 1, 1989

U.S. Department of Interior  
Bureau of Land Management  
18th and C Street, NW  
Main Interior Building - Rm 5622  
Washington, DC 20240

Frank Jaklitch  
Calvert County Department of Planning

Draft Study of Land Information Systems

John Thomas, Executive Director of the National Association of Counties has asked us to review the above-referenced study.

While the referenced system describes an ultimate national goal, the section on funding must be somewhat inadequate. The problems and expenses encountered by local government in managing our small system lead us to believe that realistically enlisting the cooperation of all government levels will be difficult to achieve.

Our particular program is based on State Tax Tapes used jointly by the Assessment Office and our Planning Office. Information included on each parcel includes election district, map number, parcel number, zoning, critical area designation (bulkhead, pier, etc), acreage, land use, improvements (owner-occupied), house number, historic district, deed reference, tax identification number, mailing address, road frontage and road classification.

Since our system is relatively new, it is premature for us to offer advice in coordinating a cross-referenced data base for the entire country. At this point in our process, our only assessment of the proposal is that it seems almost insurmountable in some respects.

As we grow and learn more about the possibilities of our own information system, we would be glad to share any of our experiences that might be helpful in planning this National Land Information System.

c: John Thomas, NACO

(Ms. Pat Korp, 17 August 1989, page 2 of 2)

As is pointed out quite well in the three examples of benefit/cost studies on page 48, these programs save money. That is what should be sold to the public and to local governments, so that the federal government educates and coordinates local effort rather than provide local funding. On page 39 the report discusses satisfaction "of high federal standards and frequency of reporting of local conditions as a prerequisite for receiving Federal funds". Given the tendencies associated with bureaucratic organization and control, I fear the cost of "reporting" may exceed the savings earlier described, resulting in higher taxes for no improvement over what could have been done as well but at less cost by the local governments with education from the Federal government, but no grants.

Also, in the paragraph preceding the Education heading on page 55, there is a discussion regarding funding through user fees, which is also mentioned briefly in other parts of the report. As mentioned therein, land information is available to the interested citizen at the present time. It may not be convenient, but it is available. If governmental agencies exempt themselves from "user fees" because they are government, and then user fees are computed by dividing the total cost of the LIS program by the anticipated number of private requests for information, as seems to be the trend in this neck of the woods, then, for practical purposes, the individual citizen has in fact been denied public information which is presently available. I fear that this could happen, and so cannot support "user fees" unless they are satisfactorily defined.

I am most eager to see the Action Plan in the final report.

Thank you for your consideration.

Yours truly

Albert J. Heidener, PLS

cc: J. Heidener, President ACSM



International Association  
of Planning Officers

573 East 62nd Street  
Chicago, IL 60637-6800  
Tel: 312-467-3900  
Fax: 312-467-2248

U.S. News  
& World Report  
Member since 1978

August 4, 1989

Mr. John Moeller  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

Thank you for the opportunity to review the initial draft of A Study of Land Information. It is gratifying that there is some Congressional interest in improving land information management systems. I believe the report will satisfy the Congressional mandate in Public Law 100-109. I hope that the report also will provide an impetus for a variety of developmental activities by the federal government, state governments, local governments, and other organizations. I think its chances of being influential will increase if some revisions are made.

I will try to outline my main ideas concerning desirable revisions in this letter. Others may be gleaned from my marginia. At this juncture I would like to apologize for being able to provide only a cursory review within your timetable and for failing to phrase all of my critical comments constructively--I do appreciate the advantages and disadvantages to team writing efforts.

Executive Summary. I prefer executive summaries that focus attention on major conclusions, recommendations, and their rationale, rather than summaries that provide only a straight-forward synopsis.

Chapter 11, Background. I think chapters 11 through V could benefit from a thorough technical and copy editing to eliminate fuzzy writing, needless repetition, contradictions, and hyperbole. Having said that, Chapter 11 makes two important contributions to the report: (1) it introduces the concept of land information management and (?) adequately defines land information system. Some thought might be given to defining land management, because the terms "land management" and "land information management" become confused in Chapter III. Chapter 11 begins a tendency to overwork the terms compatible and compatibility to the point of misuse. Similar problems occur with the use of technology, because several technologies are involved (those of geodesy, base mapping, digital mapping, and data processing and those of the disciplines in which land information is generated or used).

Mr. Moeller  
Page Two

Chapter III, Land Information Management. Chapter III misses an opportunity to clarify some important concepts and issues. I think the "management goals" of land information managers should be restricted to the collection, storage, and retrieval of land information, rather than encompass how information is used to benefit property owners and citizens. Managers, of course, need to be aware of functional needs in order to assess "compatibility," develop standards, define data elements, design data collection programs, and so forth--subjects that are largely ignored in the chapter, as are such "people" issues as finding competent technicians and skillful managers who can form and maintain coalitions of governments and agencies. Arguably data collection is more expensive than data conversion. In any case, data collection deserves more comprehensive treatment than it gets.

I find the discussion of institutional barriers to coordination un insightful. I regard decentralized government as a cultural fact of life no matter how anachronistic it may seem. If one accepts that view, one needs to explore strategies for ameliorating the situation (e.g., modifying laws to encourage or require participation in LIS development, providing financial incentives, or creating new special purpose governments or government agencies charged with the development of an LIS within an inter-governmental framework).

Chapter IV, Issues identified in Previous Studies. Chapter IV would be more useful if, rather than merely summarizing recommendations, more attention were devoted to the "issues identified" in previous studies. The excellent summary on pages 22 and 23 is an example of what would be useful.

The report on the status of implementation of recommendations in previous studies in Chapter IV seems curiously skewed. I did not notice any mention of the National Center for Geographic Information and Analysis. Although it would be impossible to mention all of the activities of professional/trade associations, I think the activities of the American Public Works Association are worth mentioning. Other organizations including the American Planning Association and IAAO have done such things as form special interest groups, appoint committees, issue publications, and organize seminars and conference sessions on LIS. The program of organizations like IIA and the Lincoln Institute of Land Policy might also be mentioned.

Chapter V, Ongoing Activities. Chapter V would be much more useful if the cases examined were compared to a set of standards that comprehensively define a model land information system, so that the reader could appreciate the interesting

August 7, 1989

Mr. JOHN MOELLER  
Acting Assistant Director, Support Services  
U.S. DEPARTMENT OF INTERIOR  
BUREAU OF LAND MANAGEMENT (840)  
18th + C. STREETS - N.W. - ROOM 5622  
WASHINGTON, D.C. 20240

RE: INITIAL DRAFT - EVALUATIVE SUMMARY  
LAND INFORMATION STUDY

DEAR MR. MOELLER:

As project manager of the Allegheny County  
Computer Mapping and Land Information System Project,  
I was asked to respond to your letter of July 14, 1989,  
in which you requested comments regarding the  
Initial Draft of the Executive Summary of the  
Land Information Study mandated by Section  
8 of Public Law 100-809. This response is not  
on County letterhead because I was given the  
Draft and I left the office to attend URISA '89.  
I prepared this response at the Conference.

Allegheny County has a land area of  
1730 square miles and a population of 1.4 million.  
The County contains a major city, Pittsburgh,  
established suburban areas dominated by

Mr. Moeller  
Page Three

features, strengths, and weaknesses of the various examples. I do not think it would be very difficult to assess the progress toward implementing the basic elements of a model land information system in each state using published data, which could be presented in tabular form (see example).

Chapter VI, Coordination. Chapter VI stands as an example of intelligent, insightful writing.

Chapter VII, Guidelines/Standards. Chapter VII is good but seems truncated. Fleshing out the last column would be very helpful.

Chapter VIII, Benefit/Cost Analysis. Chapter VIII provides a competent treatment of a difficult subject. I wonder if reorganizing it might make it better. To put it another way, the logic of the current organization is not apparent to me. I think the examples of local benefit/cost analysis and the discussion of federal investments would make more sense if they followed the discussion of what benefit/cost analysis is and how it's done.

Chapter IX, Recommendations. There is much room for improvement in Chapter IX. It contains only two specific, understandable recommendations (those concerning the national LIS commission and OMB). The rest are confusing and really are little more than expressions of need, particularly the discussions of "a common approach to structuring a land information system concept" (??), standards, funding, and education. The authors apparently assume that the existing body of knowledge about LIS is adequate and that there is no need for research (although the commission is charged with "fostering" research). Similarly educational needs are seen to be of the "continuing" variety. I think there is a great need for applied, if not theoretical, research and for education before serious progress can be made in implementing LIS at the local and state government level, if not at the federal government level.

I hope these comments will be useful. Please let me know if I can be of further assistance.

Sincerely,

Richard R. Almy

Executive Director

RRA/ds

MR. JOHN MOELLER

AUGUST 7, 1989

PAGE 2

Commercial strip shopping centers, rapidly developing suburban communities, rural areas of poor farms and strip mines, decaying rural towns and large areas of undeveloped wooded land. In order to better manage the County's land-based resources, the County Commission funded a Computer Mapping and Land Information System Project. In the first two phases, a feasibility study was conducted and a system vendor selected. The County is now designing the system and preparing a demonstration project which would be at near Pittsburgh International Airport. Independent of the County, effort, the City of Pittsburgh is also developing a geographic information system. Both systems will use ARC/INFO software installed on SUN workstations.

The Executive Summary as prepared seems to address the fundamental issues facing the L I & Community. My comments will be primarily related to two areas -- standards and coordination.

The report mentioned the need for standards of accuracy for deed descriptions. This raises the large question of standards for

MR. JOHN MOELLER

AUGUST 7, 1989

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the form and content of documents which convey land or create interests therein. A state may determine that in addition to requiring standards for the legal description of the land to be conveyed, standards should also be adopted for the form of instruments to be used to effect the conveyance or create an interest therein. Such legislation may be needed or desired to make ~~the~~ use of modern records management technology more efficient, productive and cost effective. Such legislation may meet with resistance from the organized bar because attorneys may believe that the proposed statutory language may be legally insufficient to do the job it is intended to do. Those attorneys may believe that because certain words have been used over the years and have been interpreted by the courts, ~~the~~ changes should be made in conveying language or forms.

Two examples from Pennsylvania illustrate this problem. Many attorneys are reluctant to support, and may even oppose the Uniform Simplification of Land Transfer Act for the reasons cited above. In addition, many attorneys fail to use the Pennsylvania short form of deed permitted by statute, and



MR. JOHN MOELLER

AUGUST 7, 1989

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instead use archaic, verbose language which has little, if any, relevance to subdivided land transactions. Part of the reason for continued use of the long form may be habit, another reason may be a body that the use of the long, more traditional form may reduce the likelihood of a malpractice action.

Standards may also have a negative impact on the surveying profession. For example, a requirement that subdivision drawings be submitted on ~~disks~~ disks, not mylar, may prohibit smaller surveys from doing subdivision work. If a survey were to be required for each conveyance, problems of boundary resolution would arise. An arbiter would need to be established to determine which surveyor was correct.

The reason for raising these matters is to indicate the institutional difficulties in imposing standards on a disparate group of professionals. Proper standards may be appropriate or even necessary in order to fully develop L.I.S., but it will not necessarily be easy to adopt or enforce them. The final report should

MR. JOHN MOELLER

AUGUST 7, 1989

PAGE 5.

address this problem.

With respect to the issue of system coordination, if the federal government were to impose rigid standards on the state or local governments, then a question of unwarranted intrusion into state or local affairs may be raised. Because the land parcel is the basic unit of an L.I.S., and because the local government has primary jurisdiction over parcels, care should be taken when determining coordination issues that the proper balance struck between legitimate federal needs and local government autonomy.

I regret that I did not receive the draft in time to give a more thorough, considered analysis. If I could be of further assistance in any way, please advise. Please also send me a copy of the final report.

Very truly yours,

R. Jerome Anderson

R. JEROME ANDERSON

cc: Mr. John P. Thomas, NACo

# GEOGRAPHIC INFORMATION MANAGEMENT SYSTEM

386 North Arrowhead Avenue • San Bernardino, CA 92415-0133 • (714) 387-4284



COUNTY OF SAN BERNARDINO  
ENVIRONMENTAL  
PUBLIC WORKS AGENCY

CRAIG H. GOOCH  
Manager

August 9, 1989

U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N. W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Thank you for the opportunity to review and comment on the initial draft of the Executive Summary of the Land Information Study. I concur with the summary and find that it is on target for the actions needed to improve the quality and availability of land records to government and the private sector.

The experience of the study team is reflected in the focus towards five important factors for promoting land information technology.

- A common LIS concept approach.
- Standards and guidelines.
- Education and training.
- Funding alternatives and incentives.
- Coordination and leadership.

I support your focus on these issues and believe this approach is both sound and viable.

San Bernardino County is implementing a multi-organizational LIS for use by city, county, State and Federal government as well as utilities and the private sector. Our system will utilize GIS capabilities by linking computerized parcel maps to tabular parcel records.

Our findings indicate the most difficult aspect of implementing a multipurpose LIS is obtaining sufficient initial funding and coordinating multiple organizations during the system planning and implementation. Educating management in government and private enterprise of the benefits of modern LIS is the most important activity for securing funding and agency commitment. Although there are many significant technical considerations for implementing a multi-participant LIS, the organizational and political issues pose a greater challenge.

The Executive Summary Recommendations should emphasize the need for a funding commitment for continued maintenance as well as initial start-up funding. As stated in the Executive Summary, the information is a capital resource with its value linked to its usefulness to support informed decision making. Our experience has shown that a commitment to information maintenance is critical for an LIS to achieve its intended goals.

Department of Interior  
August 9, 1989  
Page Two

In Southern California, there is an immediate need for a cooperative LIS to meet the challenges of managing growth and supporting expanding commerce. As Chairman of the Southern California Computer Aided Mapping Association (SCCAMA), I am leading a cooperative project for illustrating the capabilities of a multi-organizational LIS. The project is called "Project America."

Project America is being supported by private industry and local government in the development of a one square mile parcel based demonstration LIS. The objectives are to:

- 1) Establish standards for data compilation, formats, and data exchange;
- 2) To demonstrate the ability to share information on a variety of hardware and software platforms; and,
- 3) Develop educational materials for business and government management on the methods and feasibility of a shared LIS.

The progressive actions of San Bernardino County management and the research of SCCAMA is helping Southern California move towards a shared LIS. However, the Recommendations outlined in the Executive Summary are needed and action on the recommendations should be supported immediately. Failure to act in a timely manner may cause additional implementation difficulties as organizations independently implement LIS to meet their specific requirements without a broad view of multi-user system benefits.

I look forward to monitoring the progress of this study and its impact in shaping policy relating to LIS. If you would like additional information about the LIS activities in San Bernardino County or SCCAMA, please feel free to contact me. Thank you for the opportunity to comment on this important matter.

Sincerely,

CRAIG H. GOOCH  
GIMS Manager

CHG:dsm

cc: Bob Ingram  
John Jaquess  
Harry Mays



# SAN JUAN SURVEYING, INC.

SUITE 4 COURT STREET PROFESSIONAL BUILDING

Phone (206) 378-2300 376-4669 P.O. Box 611  
FRIDAY HARBOR, WASHINGTON 98250

July 31, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th and C Street N.W.  
Main Interior Building, Room 5622  
Washington D.C. 20240

Re: Executive Summary of L.I.S.  
July 14, 1989

Attention: Mr. John Moeller  
Acting Assistant Director, Support Services

Dear Sir,

In response of your request for review and comments in regard to the above, there are a number of areas addressed which, during the past thirty years of practice, I have had to deal with. Nearly ten years ago I had the opportunity to become acquainted with some of the Land Information Systems currently in place and operative in Europe, particularly in the Netherlands. Since 1974 we have utilized a county wide numerical parcel identifier for land use planning and land division efforts, and for just slightly longer, we have stored digital data for land boundaries and mapping. We have utilized a number of different computer hardware/software systems during the past 18 years in our office, and have always achieved data format compatibility between programs and systems with careful planning and minimal expense.

In Land Information Systems, it is necessary that the attributes be directly related to land parcels, as opposed to a generalized "picture" concept, which would be more properly referred to as a Geographic Information System (GIS). The management of digital data is an extremely sensitive exercise. Today, land information is generally available from reports and maps, each which clearly states the author and/or the party responsible for the data shown, and the accuracy thereof. When this information is reduced to digital form and stored in a computer, the attributes disappear in many cases. Geodetic quality data is intermingled with digitized data obtained from unsealed aerial photography. Not only has this happened, but now it appears to be more frequently occurring. A good example of the intermingling of non-compatible data is the current

Executive Summary of L.I.S.  
Page 2 of 4  
July 31, 1989

BLM "Geographic Coordinate Data Base". Per BLM published information, section or quarter corner locations are being obtained from various sources, such as BLM surveys, private land surveys, original general land office surveys and "digitizing the location of found corners from various map sources or photographs". The data is being co-mingled and then "manipulated" or "rubber-sheeted" to a loosely controlled and non-substantiated framework. BLM's published contention that this is a system which ties data to the "legal" descriptions of specific land parcels is a bureaucratic atrocity based either upon willful deceit or total ignorance.

The stated concept that land information data should be land parcel relative (cadastral) and all be tied to geodetic control is indeed proper and generally accepted. The geodetic control in the United States, consists of a network of monumented control stations, which has not been maintained, is not currently or in the future intended to be maintained, and is rapidly deteriorating due to neglect. The mark maintenance program of NOAA has been cancelled for lack of federal funding. As it is necessary to make physical ties between the cadastral control points (land parcels) and geodetic control points, lacking monumented control points it will require global (satellite) positioning, which is to be done on a local basis. It is absurd to believe that every local governmental and private surveyor in the United States will have immediate and economic access to GPS within the next ten years.

In the area of standards, I would suggest that the current federal standards for the measurement of land parcel boundaries, and the national map accuracy standards for representation of same, are inadequate for dealing with individual parcels of land. To the best of my knowledge, except for the state of North Dakota which reserves the practice of preparation of new land descriptions to land surveyors, any individual may prepare a description for a parcel of land and place the same of record. The only standard that is nationally recognized is that of the courts, whereby, a land description is sufficient if it may be located by a competent surveyor. If an L.I.S. is to be based upon individual parcels, then it will be necessary that only qualified land surveyors be utilized for the preparation and examination of land descriptions for parcels being created, or prior to any parcel data being entered into a computerized data base. Within the entire spectrum of avocations which are, or will be, involved in the creation and maintenance of a land information system, there is no professional except a registered land surveyor, who possesses certified expertise and is personally responsible for the reliability and accuracy of their work. The largest problem facing the entire L.I.S. concept, and the ultimate useful implementation thereof, is that no agency or individual is capable (or willing) to assume responsibility for potential inaccuracies or damage to the user(s) of the L.I.S. information. Unless data is reliable, and further, the provider thereof is fully responsible for any damage caused from use of the data, the L.I.S. system cannot be utilized in a truly beneficial manner.

BOUNDARY SURVEYS  
LAND USE PLANNING  
MAPPING and PLATTING

I am not aware of the benefit/cost analysis that may or may not be appropriate in regard to an L.I.S. The prime examples of local geographic and land information systems which have been brought to my attention have accuracies which are, at best, 1/10 of the positional tolerance needed for a cadastral parcel based system. The lowest acceptable accuracy at this time for land parcels is one part in 5000. The most recent example of resistance to any type of standards is with the pipeline industry, which does not want accurate location or mapping of as-built underground pipelines. The utility industry is enacting legislation throughout the nation requiring "call before you dig" regulations. These regulations, although purported for safety, are really needed as the result of inadequate location of utilities installations and improperly described easements which cannot assuredly be utilized. With a questionable past practice, the utilities can now be seen embarking on even shoddy practices in regard to proper location and mapping. This would not nearly be as tragic if it were not the fact that there are dozens of instances of buried utilities' lines being struck even after location, or at depths of less than 12".

The establishment of a structured land information system with minimum standards, acknowledged to be achievable in a relatively short period of time, will be completely ineffective and unusable unless the base data, needed to be acquired at the local governmental level, can be assured. Nation-wide, local mayors and county commissioners are increasingly demanding that the requirements placed upon their jurisdictions by state and federal government laws include adequate funding for the required activities. Therefore, it is a mandatory initial consideration that responsibly for the funding of the gathering of the information must be clearly stated prior to the advancement of requirements.

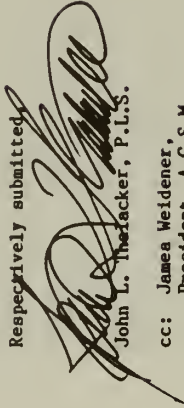
The general concept of data availability for application and use has long been a harrassing question regarding proper procedures and the degree of usefulness. From a surveyors standpoint, having to be personally responsible for location of the boundaries of individual ownerahips, there is no recognition or accommodation, nor can there be, for "trade-offs" in regard to the amount of time (and thus expense) that is needed or may be required to properly locate the boundaries of an individual parcel of land to a proper mathematical and physical tolerance. There is no such thing as "approximate" or "close enough" (which is usually followed by the verbal expression "for government work"). This concept has been acknowledgeably lacking from governmentally initiated and supervised programs for many years.

The need for adequate and accurate records, readily accessible, is understandable and recognizable. The implementation of new technology to achieve "better" information availability can be seen as needed. However, it appears that for the past 15 to 20 years, the "need" for rapid assembly and distribution of information has been driven more by the computer hardware/software industry, then by the need for local and

state governments for the information. It is interesting that experience shows that computer technology, as advanced by the manufacturers, is always in extreme excess of the actual situation; will be available "in the next several months"; and all carries disclaimers for any liability for any reason of there inadequate product performance. It appears that the need for a national land information system is being fed by the suppliers of the technology, as opposed to, the users of the information.

I appreciate the opportunity to comment in regard to land information systems and look forward to the review of the final report.

Respectively submitted,



John L. Theacker, P.L.S.

cc: Jamea Weidener,  
President, A.C.S.M.



**Pierce County**

**Planning and Natural Resource Management**

2401 South 35th Street  
Tacoma Washington 98409-7490  
Tel: 206-851-7210  
FAX: 206-851-3686

JOSEPH A. SCORCIO  
Director

August 4, 1989

John Hoeller, Acting Assistant Director  
U.S. Dept. of Interior  
Bureau of Land Management (840)  
18th & C Street NW  
Main Interior Bldg., Room 5622  
Washington, DC 20240

Dear Mr. Hoeller:

The arrival of the "Initial Draft" Executive Summary of the Land Information Study (LIS) coincides with Pierce County's commitment to implement a wide-ranging geographic information system to serve our county's needs. I hope the following comments will be of assistance to your study team:

Land Information Management

Establish a hierarchy of acceptable geodetic standards that is responsible to a range of data base development projects. Agencies or businesses with limited money or a small-scale need should be encouraged to structure their systems along the same general guidelines as highly intensive users. Once this foundation is in place, the merging of independent systems or expansion of existing databases could follow a linear path to the next level in the hierarchy. In addition, it is crucial to recommend cartographic design parameters that encourage interdisciplinary users to adhere to accepted standards of graphic representation.

Much the same as Catalan charts or early military surveys, land information systems serve as a picture of the contemporary landscape. In many cases, they offer the best documentation for drawing conclusions on how human settlement patterns change over time. For this reason, a concurrent archiving system for land based digital information should be considered.

Coordination of Roles/Responsibilities

Universities offering degree programs or extensive coursework in Land Information Management should be encouraged to broaden core courses to include geography, cartography, and communication theory. Too often, database development and applications are designed by data processing professionals with little or no background on the best methods to present information. In the long term, an interdisciplinary curriculum will insure that systems managers design their databases to assist the greatest number of potential users.

John Hoeller  
August 4, 1989  
Page 2

Benefit/Cost Analysis

In the case of using public money to finance database development, link compliance with national standards to continued funding of ongoing projects.

Miscellaneous

Consider international cooperation, especially with Canada and Mexico.

Adopt policies and procedures that encourage the sharing of information, which does not infringe upon the proprietary interests of individual companies or agencies. This could be accomplished with an incentive program.

I would like to receive a copy of your final report when it becomes available.

Sincerely,

JOSEPH A. SCORCIO  
Director

JAS:cw

PRO:jas-1

Deb Hyde, Director, PALS

John P. Thomas, Executive Director, National Association of Counties

Box 1125  
Manotick, Ontario  
K0A 2N0  
CANADA

August 6, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th and C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240  
USA

Attn Pat Korp

I have received the "Initial Draft" of the Land Information Study, sent over the signature of John Moeller, Acting Assistant Director, Support Services, BLM. To meet your deadline I have prepared this at home between business trips. I apologize for the print quality - my home system printer needs a new ribbon!

I believe that I have been asked to comment on the basis of my experience and current association with the ASPRS as a Chairman of one of the related technical committees. I am also Vice-President of the Canadian Remote Sensing Society and Secretary of Commission VII of the ISPRS. I hope that you find my perspective from another country to be useful.

#### General

Your draft report is both thorough and respectful of the sensitivities that exist in the "real world" of LIS. The need for LIS is well specified. The major problem of institutional coordination is well described. The concept of exchanges is also useful. There are but a few areas where I believe that the emphasis should be modified, and for most of these only a slight change is required. These are outlined below. The last section identifies an area in which I believe a significant research effort will be required.

#### Education

The question of education may be a broader problem than has been specified. Of critical importance is the need for education of the local county and city senior administrators and politicians. Without their co-operation, there can be no co-ordinated LIS effort. In addition to the specified need for education of the academic type for professionals, there is also a need for re-training of technician level staff. The draft clearly identifies a problem with academic (post secondary) educational problems and standards.

#### Surveys and Mapping Agency

I admit to a certain bias, but I believe that the Canadian model of a single federal agency with these responsibilities (including remote sensing R & D) has served Canada well. There is a clear distinction between the roles of the providers of the base information and those providing the thematic information in the data base. These agencies can and do work with each other, with clear division of responsibilities negotiated with each agency mandated under a signed Memorandum of Understanding. There is some jealousy with respect to mandates, but if the net result will give a better product and free-up resources to, in effect, increase budgets, the client agencies seem willing to give up the technical problems to the agency responsible for the LIS.

#### Capital vs Operating Budgets

One might also want to refer to the various problems associated with replacing a system that draws heavily on operating budgets with a capital intensive system. In my experience, there are several problems. The first is one identified in the draft. Potential users do not have the budgets to implement a new system. However this is only part of the problem. In addition there is often a reluctance to change from a labour intensive system to a capital intensive system on the part of managers who see a diminution of staff and/or operating budgets as a diminution of their authority. (There is the related question of "better a devil you know than one you don't.")

In many cases there is also a structural inability to replace a labour intensive or existing system with a new one. The agencies have operating budgets but no capital budgets and no experience in dealing with such acquisitions. In such cases benefit cost analyses are often irrelevant since the types of agencies involved all too often have no capital budgets and no way of obtaining them. Obviously, education at all levels of management, including financial administrators and politicians, is important in overcoming this.

#### Financial Subsidies and Interchange Formats

The issue of subsidies is an interesting and perplexing one. The capital/operating budget problem outlined above may benefit from a subsidy of capital. The problem is selecting an appropriate system. I would not like to see bureaucrats selecting the systems - this would distort the marketplace. For this reason, there should be considerable attention paid to interchange formats. This problem was solved on the international level for the formats for digital satellite images. It will be a difficult problem, but one that could be solved by an industry panel of the major 10 or 15 vendors. (Eg. Intergraph, ESRI, Tydac, Geovision, Pamap. etc.)

### Layers of Information

Several layers are noted as basic to the LIS. On page 54 these are identified as geodetic control, property boundary or cadastral information (including a unique identifier), and basic map information including roads, hydrography and other cultural elements. A fourth (top of page 55) includes "legal rights, other land attributes, and use information as needed by that particular jurisdiction". To that I would add land capability for potentially conflicting uses, and environmental profile. By environmental profile, I refer to a summary of past uses that may impinge upon future uses. I would suggest ensuring that the LIS could overlay capability and present use with the three first layers so as to improve decision making.

### On Analysis Capabilities and Vendor Name

The capabilities of the LIS to perform various analyses were not explored. This capability is often assumed to be resident in all LIS's. However, all analysis capabilities have not proved to be the same. A recent evaluation of GIS products by the UN FAO showed the system produced by Pamap Graphics of Victoria Canada to be the best system (and, I am told, the only one able to meet all of the benchmark tests) because of its many and varied capabilities across the whole domain of LIS. Yet compared to many other vendors, its products are neither well known nor widely used. A well known product is not necessarily the best.

### On Decision Making and Bottlenecks

Over the past two decades we have moved the land resource decision making bottleneck from the data collection stage to the decision maker. At one time the problem was considered to be getting enough good information from field work to make good decisions. We then got better at using remote sensing. The bottleneck moved to how to handle all the information that remote sensing provided. That problem appears to have now been solved with the advent of LIS. The decision maker has no more excuses. Technology has (one could argue) provided the tools necessary to make quantitatively based and consistent decisions. But what of the decision maker?

The difficulty now is that the natural resource decision making process may not be well enough understood to properly make use of the tools now available.

It would appear to me that an important but overlooked issue in LIS is the nature of decision making using an LIS. This issue appears to have been overlooked in the largely technically and economically based assessment provided in the draft. The first thing I am suggesting is that we do not know what pressures we are putting on the decision maker by providing all of the information and analysis capabilities of an LIS. Furthermore, we are not sure how wisely or

how well the decision maker will use the LIS. For example, many have found, or at least suggest, that decisions about land are frequently made not on the basis of good information, but rather on the basis of how pretty the graphics are.

There should be a thorough study of the whole decision making process in light of the importance of decisions now being faced and in light of the complexity of systems and information we are now putting in the decision makers hands. The need for continuing education and research in this domain should be obvious.

I do hope that my observations, based on a rather quick read of the document, are of use. Should you or your committee want to discuss any of my ideas further, I would be pleased to co-operate.

Sincerely,



Robert A. Ryerson, Ph.D., P.Ag.,  
Certified Photogrammetric Engineer,  
Chairman, Image Interpretation Committee,  
Remote Sensing Division, ASPRS

cc R. Hoffer  
M. Nyquist

# ACSM - ASPRS

American Congress on Surveying and Mapping  
American Society for Photogrammetry and Remote Sensing  
210 Little Falls Street • Falls Church, VA 22046  
ACSM (703) 241-2446 • ASPRS (703) 534-6617

August 2, 1989

Mr. John J. Moeller  
Deputy Assistant Director,  
Support Services  
Bureau of Land Management  
Main Interior Building, Room 5627  
18th & I Streets, N.W.  
Washington, D.C. 20204

Dear John:

As indicated in my July 28, 1989 letter, I am enclosing the Ad Hoc Committee's proposed changes to the Draft Executive Summary of the Land Information Study.

The Ad Hoc Committee paper reflects the views of the group as expressed at our July 21st meeting.

We will submit to you by early next week our revised Executive Summary reflecting the changes outlined in the enclosed paper.

I look forward to talking with you soon to ascertain when the Core Team will meet and provide further background on the Ad Hoc group's views.

Best personal regards.

Sincerely,



James L. Clapp  
Chair  
Ad Hoc Committee

cc: P. Korp

## Land Information Study

Ad Hoc Committee Comments on Draft Executive Summary

August 1, 1989

### Page 1 Introduction

The introduction should include information about why Congress is concerned with the issue. How has this issue gained attention.

Bold heading Study Approach should read Study Requirements

The text following should be a direct quote from the law. The Ad Hoc Group felt that the words had been "softened" to match the report.

### Team Composition and Consultation

Should capitalize Ad Hoc Committee, follow by "representing professional societies and organizations in both public and private surveying, mapping and related fields."

Need to add the list of organizations represented by the Ad Hoc Committee in the body or appendix of the report.

### Background

The first paragraph should be rewritten to indicate that "Land information is potentially a vital asset. All information is enhanced when it is geographically referenced."

Make the point it is an asset -- its there -- but it is not developed. Land information is vital but missing -- reasons why.

### Page 2

First paragraph Change to "As a result, public and private officials often are increasing..."

The reference to Parade Magazine article should be reworked. Note that the issue has risen to such a level that even the Sunday supplement of the newspapers carried information about the problem. Request that BLM research the source of the Parade Magazine data and possibly use that as a more serious reference.



Land Information Management

Effective land information management is essential because land information is needed regularly by many different agencies, organizations, and individuals for many different purposes. The essence of land information systems is the ability to link a multitude of land related attributes, often from many different sources and maintained by many different agencies, to a unique geographic location or area. To accomplish this, land information managers must rely on a framework that ensures compatibility among many different information systems. This framework must facilitate the sharing of public information among decision makers in both public and private organizations who require these data for day-to-day policy, management, and operational decisions.

(Next three paragraphs should be eliminated because they give too much detail which is covered in the text of the report.)

(Last paragraph in the section should be kept)

Previous Studies

(The consensus was that this section was too brief. It should summarize the conclusions and recommendations of the previous studies.)

Ten previous studies by the National Research Council and by State and private organizations have all cited a substantial need for compatible land information systems to improve land conveyance procedures, furnish a basis for equitable taxation, and provide much needed information for resource management and environmental planning. Some of the studies have suggested that additional cost savings could be achieved if the Federal Government would coordinate its own efforts on land information systems. The studies point out the urgent need for a coordinated effort in land management at all levels of government. More than half of the studies reached the following conclusions:

1. There is a critical need for better land information.
2. Land records are not uniform or related to a high quality geodetic reference system.
3. Current modernization efforts are uncoordinated and not meeting their full potential.

4. Inter-governmental relations--Federal, State, Local--require greater coordination and standards.
5. Technological advances in computers, mapping and surveying provide a foundation for integrating land information.
6. Lack of Federal leadership is a serious impediment to effective application of the technology to the LIS problems.
7. Formal legislation for a national LIS policy is required to achieve the goals of a multi-purpose LIS and appropriate funding authorization.
8. There should be a single organizational unit in Federal, State, and Local governments responsible for LIS, which is able to set priorities, coordinate efforts, act as liaison to other levels of government.

Three studies made specific recommendations for a single civilian mapping agency in the Federal government. These same studies concluded that the Federal government support the development of educational programs in land information science to insure the availability of scholars and professionals qualified to work with land information management.

This report reiterates all of the recommendations which have been made repeatedly for sixteen years. We need a structured nationwide approach to a land information system.

Page 3

Coordination and Roles/Responsibilities

Paragraph five should be rewritten as follows:

The private sector plays a dual role as builder and user of an LIS. The private sector can make a valuable contribution in the development of an LIS data base, as well as in the maintenance of the parcel maps and data. Private firms have made significant investments in equipment, personnel and training. As a result, their capabilities are extensive and varied.

Governmental agencies at all levels of government should draw upon the capabilities of the private sector for data collection and data management services. An LIS is only as good as the quality of the data collected for the system. To ensure high quality data, it is recommended that when government agencies contract with private firms that such firms be selected through a qualifications based selection process.

Another key role of the private sector is the development of new hardware and software to support LIS activities.

Page 5 and 6

RECOMMENDATIONS

(There was a strong feeling that the recommendations need to be stated more explicitly. The page should read:)

Introduction

The study team found that there is a need for a focal point that would provide the oversight for a comprehensive, consistent "network" of compatible land information systems across the country.

There is a need for readily available geodetic, cadastral, and other management data, and a recognized need for:

- \* A comprehensive approach to land information systems
- \* National standards and guidelines
- \* Education, including training
- \* Coordination, Leadership, Authority, and a broad-based commitment
- \* A focus for funding

Eliminate the following paragraph.

Land Information System Concept

To provide a framework for establishing a common approach to land information management, there must be a unified land information system concept. Therefore, compatible Land Information Systems should be developed at the local, State and Federal levels of government.

These systems should be structured on the same common components, use already existing data sources as much as possible, and be linked through a coordinate system. The components which all land information systems should contain are:

- \* Geodetic control in the form of geographical or rectangular coordinates;
- \* Legal rights and property boundary information including a unique property identifier for land parcels;
- \* Basic map information, including roads, hydrography, and cultural features;
- \* Land attributes and use information as needed by the particular jurisdiction.

Therefore it is recommended that Congress pass legislation to establish the concept of a national integrated land information management systems policy.

Standards and Guidelines - Guidelines needed to be added to the title.

Land information systems at various levels of government must provide for maximum data exchangeability. This means that certain standards and guidelines must be implemented to provide needed compatibility since the systems will not operate under a single control.

Therefore it is recommended that:

- \* Current activities regarding standards that relate to all aspects of a land information system continue. Particular emphasis should be placed on:

- adoption of and adherence to already established standards;
- development and implementation of data exchange standards;
- integration of techniques for identifying and specifying locations; and
- identification of areas that need new standards.
- \* A commonly understood data model that would establish logical relationships among land entities (parcels, subdivisions, lots) be developed.
- \* Criteria for stages of LIS development be set.
- \* Data quality and accuracy standards and guidelines be established.

**Education**

An active process of continuing education for federal, State, local and private sector individuals working in land information related professions should be established and supported by the private sector, government agencies, professional associations, and academic institutions.

Therefore it is recommended that:

- \* A procedure for personnel exchanges across all levels of government, the private sector, and different geographic regions, as well as an ongoing training program for State and local practitioners be implemented.
- \* A mechanism be established for continuing curriculum development to foster long-term orientations to land information management and to provide for a wide variety of media for training delivery to reach the vast number of individuals working in land information related professions.

The paragraph on technical and financial assistance should be removed from education and placed under coordination.

**Funding**

Should be moved to follow the section on Coordination.

**Coordination and Responsibilities**

Even though the need for Land Information is increasing daily, and billions of public dollars are being spent at all levels of government to address this problem, there is currently no organization or individual who has the responsibility and authority to coordinate these activities in an efficient system. This is the current situation in spite of the fact that the problem has been identified by multiple studies over the past sixteen years.

Therefore it is recommended that a single federal surveying and mapping agency be created. This agency should combine the basic federal responsibilities of surveying, mapping and land information. A detailed plan to implement this agency should be prepared including such elements as: the institutional make-up; the advantages; and the potential cost efficiencies which should be realized. The complete plan should be sent to the appropriate congressional committee for consideration.

It is also recommended that an independent entity be established that would provide leadership and coordination, with the requisite authority, so it can provide the needed impetus for all levels of government and the private sector to develop a commitment to the land information system concept. This could be achieved at the Federal level through the establishment of an LIS Commission. The immediate authorization of an LIS Commission is critical to the coordination of land information systems at all levels of government and the private sector. The Commission should provide an interim solution for coordination efforts.

In the area of technical and financial assistance, state and local levels of government have identified a need for assistance in the establishment and maintenance of appropriate land information systems. Therefore it is recommended that a process for providing such assistance be established.

**Funding**

Although coordinated land information systems will be less costly than systems developed independently at all levels of government, a funding strategy is needed to ensure the successful implementation of compatible land information systems at all levels of government. Such a strategy would provide a mechanism to encourage involvement at all levels of government and the private sector and to effectively channel expenditures that are already occurring.

Therefore it is recommended that a funding strategy be developed which would address:

- \* Existing sources of funding and current expenditures in government and the private sector.
- \* Funding of the LIS coordination organizations;
- \* Incentives for sharing data between government agencies and the private sector such as utilities;
- \* A commitment to long term progress and investment;
- \* The distribution of costs among LIS users.



# Department of Community Development

Administrative Center, 219 E. Cherry, Flagstaff, Arizona 86001

Phone 779-6716

July 26, 1989

John F. Thomas, Executive Director  
 National Association of Counties  
 440 First St. NW  
 Washington, D.C. 20001

RE: Land Information Systems

Dear Mr. Thomas:

In response to your letter to MACo Conference Participants and after reviewing the Draft Executive Summary on Land Information Systems, Coconino County has long recognized the need to develop such a system. The county's Integrated Land Records Committee, chaired by Helen Hudgens, County Recorder, has for several years been working toward the eventual implementation of such a system. Funding has of course been the principal impediment. Meanwhile, we are still in the "dark ages" as far as information management is concerned. The second paragraph under Background in the Draft Summary perfectly describes our situation.

Elsewhere, the Arizona State Land Department has acquired and is using ARC-IMFO. Following this lead, two or three counties have also purchased this software, as has the City of Flagstaff. Coordination of such activities, which appears to be the principal goal as stated in the Summary, is certainly highly desirable. If coordination results in lowering the initial cost across all governmental entities, so much the better.

I have no specific comments on the Executive Summary, but support the goals and recommendations.

Sincerely,

William L. Towler, Director  
 Department of Community Development

WLT:rjm



# COLLIER COUNTY GOVERNMENT

DIVISION OF ADMINISTRATIVE SERVICES  
REAL PROPERTY MANAGEMENT DEPARTMENT

3901 E. TAMiami TR.  
NAPLES, FL 34103  
(813) 774-0091

July 24, 1989

A CERTIFIED BLUE CHIP COMMUNITY

John P. Thomas, Executive Director  
National Association of Counties  
440 First Street NW  
Washington, DC 20001

Re: Management of Land Information  
Comments on the Draft Executive Summary

Dear Mr. Thomas,

I have been asked by Commissioner Anne Goodnight to comment on the draft executive summary dealing with the management of land information.

The Real Property Management Department serves under the Collier County Board of County Commissioners. The Department assists in all real estate type transactions on behalf of the Board and in turn maintains an inventory of county-owned land and facilities.

The Property Appraisers Office, as I'm sure you are aware, provides an inventory not only of county-owned land but all property located in Collier County for purposes of establishing property tax assessments. A copy of the draft executive summary has been forwarded to Mr. Sam Colding, Collier County Property Appraiser, for his individual comments.

My comments are based on the extent of maintaining an inventory on county-owned property as mentioned previously.

To date with the limited manpower available, the Real Property Management Department has only kept a manual inventory of county-owned property. This system includes filing of original documents (i.e., deeds, easements, etc.) and manually adding the description and location to an existing property log.

It has been tentatively approved for October 1989 to contract with an individual or firm to produce a complete county-owned inventory system on an approved data base system. This data base

John P. Thomas  
July 24, 1989  
Page 2

would include such information as grantor, date of conveyance, use restrictions, zoning, estimated value of land and buildings, etc.

The type of data base system is yet undetermined. Preliminary research has indicated RBase and DBase to be the prominent software used for this purpose.

In reviewing the Draft Executive Summary, it would be extremely beneficial for this department to be linked with State and Federal agencies providing the same information on their respective inventory system. The public frequently contacts our department seeking information on State or Federal lands.

In the Draft Executive Summary there was no mention as to the type of land management system being considered or the estimated costs of the needed hardware and software. In any case the recommendation to provide training on the established uniform governmental system is an excellent idea.

As a preliminary summary, I agree with the concept and the need for such a land management system and hope one will be implemented shortly as not to duplicate many present County, State and Federal efforts.

Should you have any further questions or comments, please feel free to contact me.

Sincerely,

Sandra Taylor  
Real Property Management Director

ST/kh

cc: Anne Goodnight, Commissioner  
Neil Dorrill, County Manager  
Leo Ochs, Administrative Services Administrator  
Deena Quinn, Real Property Supervisor

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

916 N. EAST AVENUE • P O BOX 1607 • WAUKESHA, WISCONSIN 53187-1607 • TELEPHONE (414) 647-9721

Serving the Counties of  
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WALWORTH  
WASHINGTON  
SAUKESBA



August 11, 1989

Mr. John Moeller  
Acting Assistant Director, Support Services  
Bureau of Land Management  
U. S. Department of the Interior  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Attention Pat Korp

Dear Mr. Moeller:

Pursuant to your letter request of July 27, 1989, I have reviewed the initial draft of your report entitled "A Study of Land Information. I was pleased to receive the draft and read it with great interest. The draft report is, in my opinion, very good, being well written as well as conceptually sound. You and your staff are to be complimented on the high quality of the document.

I have but six comments to offer for your consideration, none of which are truly substantive but rather concern either emphasis or detail.

1. The report places a great deal of emphasis on the need for, and value of, information. It should be recognized that there is a growing concern that managers may, as a result of technological changes, be provided with too much information--to be, in effect, inundated by information--and that this may hinder rather than further the making of sound decisions. In this respect, it might well if the report differentiated between information and intelligence and noted that in order to be assured that managers are provided with pertinent information and related analyses--with intelligence--the managers and their technical support staffs must be actively involved in the design of the information systems.

2. The draft report lists the components of a land information system as: 1) geodetic control in the form of geographical or rectangular coordinates; 2) property boundary or cadastral information, including a unique property identifier for land parcels; 3) basic map information, including roads, hydrography, and other cultural features; and 4) information about legal rights, other land

Mr. John Moeller  
Page 2  
August 11, 1989

attributes, and use information as needed by that particular jurisdiction. Substantively, this list is the same as that presented by the National Research Council in its reports, although the order of the cadastral and base map components are interchanged (it should also be noted in passing that hydrography is not strictly speaking a cultural feature on a map since most of the hydrographic components are not constructed by man). It might be better to use the descriptions of the components as provided in the National Research Council report, particularly with respect to the fourth component which the Council describes as follows:

"A series of registers or files that record interests in land parcels, each including a parcel identifier for purposes of information retrieval and linking with information and other land data files."

3. On page 12 of the draft report, the statement is made that, since proper management requires an accurate description of location, a reference framework that is tied to geodetic control is essential. I would suggest that the primary, if not sole, reason for basing the reference framework on a geodetic control survey is the need to accurately correlate earth science with cadastral information. After all, in this respect, the U. S. Public Land Survey System provides a very good description of location--ask any farmer--and does so in a much more understandable way to the lay person than do geographic coordinates.

4. The portion of the draft report which gave me the greatest problem was that dealing with benefit-cost analysis. I am not at all sure that it is possible to do a sound and convincing benefit-cost analysis with respect to creation of a land information system, any more than it is possible to do such an analysis--at least that is convincing--for the provision of geodetic control. The chapter concerned appears to be ambivalent in this respect, on the one hand, making a case that decisions concerning the creation of land information systems cannot be made on the basis of benefit-cost analysis and then, on the other hand, proceeding to give examples and to, in a generalized way, pursue such analyses in connection with land information systems. Examples of benefit-cost analyses at the local level are given, but these appear unconvincing to me. For example, the City of Minneapolis example apparently includes the benefits of word processing among the benefits to be derived from the creation of a land information system! I would suggest that this particular section of the report be carefully reconsidered.

5. On page 54 of the recommendations, it is indicated that the recommended chartered Commission would have sufficient authority to enforce or reward adherence to basic standards. I would assume such authority would be related only to the federal establishment and not to either state and local government or private enterprise toward

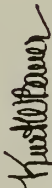
Mr. John Moeller  
Page 3  
August 11, 1989

which the recommended Commission should be entirely advisory. If my assumption is correct, then this should be clarified in the text.

6. My final comment concerns the statements in the draft report that consideration be given to basing user fees for land information data on the value of the data. Equity is an issue that should be considered in this respect. Such a policy would preclude certain segments of our society from having access to information which may have been collected with taxes paid in part by those segments. It is for that reason that the State of Wisconsin has an open records law, which requires that public agencies make their files available to the public upon request and to do so at the cost of reproduction.

We hope that the foregoing comments will be of some use to you as you prepare a final draft of the report. Once again, let me stress that I think the report is a very good one.

Sincerely,



Kurt W. Bauer  
Executive Director

KWB/ms

## Institute for Land Information And Its Land Information Assembly ILI/LIA

August 10, 1989

Task Force for  
Study of Land Information Systems  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C Street, N.W.  
Main Interior Bldg., Room 5622  
Washington DC 20240

Reply to:

Katie L. Dixon  
Salt Lake County Recorder  
2001 South State #N1600  
Salt Lake City UT 84190-1150  
Phone: 801/468-3398

Reference: A Study of Land Information Systems  
Draft Executive Summary

Gentlemen:

The members of the Institute for Land Information (ILI) and the chief executive officers of the member organizations have been well briefed and are familiar with the land information systems study mandated by Public Law 100-409.

ILI members and their organizations are very supportive of the concept of coordination and the development of standards for land information systems (LIS) and urge the enactment of Federal legislation to establish a commission to coordinate and provide leadership to develop standards for LIS activities.

Sincerely,

KATIE L. DIXON  
President, ILI

440 First Street, N.W., 8th Floor  
Washington, D.C. 20001





# CITY AND COUNTY OF DENVER

DEPARTMENT OF PUBLIC WORKS

ASSET MANAGEMENT  
RM. 205-1445 CLEVELAND PL.  
DENVER, COLORADO 80202  
PHONE: 575-2281

August 7, 1989

John Moeller  
Support Services  
United States Dept. of Interior  
Bureau of Land Management (840)  
18th & C Street, N.W.  
Main Interior Bldg., Rm. 5622  
Washington, DC 20240

Dear Sir:

I have reviewed the "Initial Draft" of the Executive Summary of the Land Information Study and have two comments.

The first involves a possible list of counties or agencies that have participated in this report. It is not uncommon for neighboring municipalities to develop different approaches to data base or property management. By publishing a list of participants, possibly including contacts and telephone numbers, the report will enable readers to continue to research land information systems individually, and may help adjacent municipalities to develop joint, more efficient, less costly systems.

The second recommendation I have would be to include an address where further updates or recommendations may be made to the Department of the Interior. By enticing comments in the "final Draft", the dialogue between the Federal, State and local governments will continue. This is especially important given the improvements and advances in computer systems and technology. I assume the report will reach the hands of many people, agencies, or municipalities that were not included in the initial surveys. These potential sources of information may have further comments on information systems that will make possible a second volume or update.

After generating the awareness, we do not want to "close the door" on further opportunities.

Could you please forward a draft copy of the entire report to myself, at the address listed on my card.

I would be happy to further assist the effort in any way possible.

Sincerely,

Derek Brown,  
Senior Real Estate Analyst

/cb



Der Direktor  
des Landesvermessungsamtes Nordrhein-Westfalen

14.08.1989

Please inform Mrs. Johnson.

To: Mr. John Moeller, Assistant Director, U.S. Department  
of Interior, - Bureau of Land Management -, 18th & C  
Streets N.W., Washington, D.C. 20240, U.S.A.  
From: Direktor des Landesvermessungsamtes Nordrhein-Westfalen  
Dipl.-Ing. Klaus Barwinski, Muffendorfer Str. 19-21,  
5300 Bonn 2, West Germany

Dear John,

Thank you very much for the really interesting study of  
Land Information.

From our point of view please find enclosed the following  
statement.

With my very best personal regards

Sincerely yours



1. Definition of the Land Information System

The given definition (page 2) should include the idea of a coordinated network of land information systems adopted at the different levels of government as it is mentioned on the pages 5 and 54. Thus, the political and administrative independence is stressed as well as the necessity of standards.

... and refers to any information system LAND NETWORK that is designed ...

In this study also seems to be a terminological conflict between the terms 'land information system' and 'land information systems'.

2. Standards

The necessity of standards is adequately pointed out and described in detail. Informations which are completely missing are details on the available standards, on standards which are being developed at the moment or still ought to be developed, i.e. information on relational databases, SQL, GKS, UNIX, OSI/ISO-reference models (page 3 and chap. VII). Chapter VII and page 54 should be complemented accordingly.

3. Coordination (Chapter VI)

As a consequence of the remarks in part 2/Standards the question of a cooperation with data processing experts has remained untouched, especially their cooperation concerning the technological problems of an LIS (page 54).

In this study the problems of the necessary training had been touched and should be considered by e.g. universities. It also might be helpful to consider the establishment of a National Training Center for LIS.

4. Ongoing Activities (Chapter VI)

The ecological use of the LIS was only mentioned once, at random on page 25. In the FRG and in Europe the ecological problems are central topics of information systems. Their political emphasis might be different in the US.

OFFICE OF REGISTER OF DEEDS

*Brown County*

BROWN COUNTY OFFICE BLDG., ROOM 217 • 111 N. JEFFERSON ST.  
GREEN BAY, WISCONSIN 54301 • PHONE (414) 496-3278  
MAILING ADDRESS: P. O. BOX 1600 - GREEN BAY, WI 54305-5600

August 7, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Sir:

In response to your letter of July 14, 1989, I feel your "Initial Draft" is very good. You address all aspects of land modernization that need to be addressed. The main key to success is 100% cooperation among all land related entities at the local, state, and federal level. This will be the greatest challenge!

Land records in Brown County, Wisconsin, are in the beginning stages of modernization. We are limited to our own progress by the lack of cooperation among land related departments and the County's lack of financial commitment to this effort.

Currently the Register of Deeds' tract index (history) and the County Treasurer's tax roll are on computer. Neither system is linked to the other due to the lack of a unique parcel identifier system.

Brown County's parcel number and mapping systems are inadequate. Our County Surveyor (who has jurisdiction over the parcel number system and mapping) has started to use a computerized mapping system, but it is not available for public use nor is it linked to existing computerized land information. He estimates it will take his staff 17 years to create a computerized base map for Brown County. Meanwhile we do not have the ability to link a multitude of land related attributes to a unique geographic location or area. An entity needs to be established at our local level to provide leadership and coordination of a land information system.

The Wisconsin Land Information Association, comprised of various public and private individuals and corporations, has introduced Assembly Bill 269 (copy enclosed) to create a state land information board to provide technical assistance regarding land information and to coordinate and regulate the modernization of land records. The bill gives the board rule-making authority over the collection and storage of land information by state agencies and local units of government.

CATHY WILLIQUETTE  
REGISTER OF DEEDS

DEBRA A. GORE  
DEPUTY

MARY A. COWAN  
DEPUTY

U.S. Dept. of Interior  
August 7, 1989

Page 2

There has been a lot of controversy over Assembly Bill 269 and I am uncertain of its passage this Fall. Regardless, it is imperative that we all work together toward the common goal of modernizing land records at all levels.

I feel direction is needed at the state and local levels of government to attain success.

Sincerely,

*Cathy Williquette Breunig*  
Cathy Williquette Breunig  
Register of Deeds  
Brown County, Wis.

Encl

123 Kingston Drive  
Slidell, Louisiana  
70458-1737

August 4, 1989

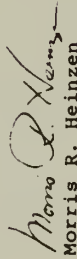
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C Street, NW  
Main Interior Building - Room 5622  
Washington, DC 20240

Gentlemen:

I am enclosing my comments and recommendations concerning the "Initial Draft" Summary of the Land Information Study (LIS) in response to your letter of July 14, 1989. At the request of Mr. James P. Weidener, President of the American Congress on Surveying and Mapping, I have reviewed the initial draft summary.

I regret being unable to forward my comments earlier since I am presently preparing a paper for presentation at the Gulf Coast Chapter's Hydrographic Society Symposium.

Sincerely,

  
Morris R. Heinzen

COMMENTS ON THE "INITIAL DRAFT" OF  
A STUDY OF LAND INFORMATION SYSTEMS

1. Introduction - no comments or additions.
2. Study Approach - no comments or additions.
3. Team Composition and Consultation - I would suggest adding the following to this section: National professional societies including the American Congress On Mapping and Charting, American Society of Civil Engineers, etc.
4. Background - This section appropriately describes the problems facing Land Information Systems (LIS's). The problem is not only spread in 16 agencies but into each county court house in the United States. Using the assumption that there is average of 30 counties per state, I estimate there are 1500 agencies just registering land sales.
5. Land Information Management - no comments or additions.
6. Previous Studies - no comments or additions.
7. Ongoing Activities - no comments or additions.
8. Coordination and Roles/Responsibilities - no comments or additions.
9. Guidelines/Standards - I do not agree with using a outdated method as the National Map Accuracy Standards to express geographical or land information accuracies. The Defense Mapping Agency (DMA) has substituted an measurement standard for their surveying and mapping requirements expressed in meters instead of using the National Map Accuracy Standard. In this one case the new Land Information System (LIS) should use a similar method of expressing point, line, and area accuracies.
10. Benefit/Cost Analysis - I would have like to have seen a more definitive benefit/cost analysis presented in order that congress can appropriate the necessary funds to support a United States wide Land Information System, LIS.

Skyjettes Consultants Inc.

Surveying, Mapping, Photogrammetric  
and Management Systems

August 11, 1989

U.S. Department of the Interior  
BLM(840)  
18th and C. Streets, N.W.  
Main Interior Building- Room 5622  
Washington, D.C. 20240  
Attn: Pat Korp

P.O. Box 10761  
Eugene, Ore. 97440  
Phone: 503-683-2504

Surveying, Mapping, Photogrammetric  
and Management Systems

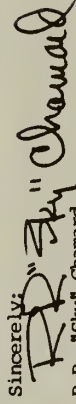
P.O. Box 10761  
Eugene, Ore. 97440  
Phone: 503-683-2504

Skyjettes Consultants Inc.

Again, I agree data in the report on standards and implementation is needed, but I fear that the report will be another study that will be placed on the "back burner" and will be deeply involved in the Agencies political arena = nothing done.

Establish the National LIS Commission by Congressional Action in the next 12 months or forget it.

Sincerely,

  
R.R. "Sky" Chamard  
Consultant, CP#393

This letter is in response to John Moeller's correspondence concerning the Initial Draft of the Land Information Study as per PL 100-409.

The need for Standards as applied to activities in the LIS arena is certainly a top requirement Nationally. As indicated in the study many States, Counties and Cities are in the LIS-GIS formation process. Standards vary and are often inconsistent between agencies in the same State and for sure within Federal Agencies. Standards and the enforcement of them is a problem that must be addressed NOW! Federal leadership is a must, who and how is the problem. Many Agencies plead "we are different" and won't change without tough leadership and I doubt we have it any stronger than in 73 when the OMB Report came out. If you can't control the Feds you may be able to control others, but that will take dollars to buy your way in, only with dollars will others follow standards.

I agree with the primary functions recommended to be vested in the proposed LIS Commission. The Commission must be established sooner than Government at the Federal level can move. Expenditures at the local levels are being used for their systems every day and the more they are involved the less interested they will be to invoke change.

The main concern I have is that the LIS base be sound and to an accuracy that will satisfy multiple uses. The 1 to 24,000 US base USGS quad maps just won't do it. Private mapping sciences organizations can provide the necessary data in formats and accuracy specified in the Standards. A single mapping and surveying agency at the Federal level cannot provide more than a battle ground that will prolong the implementation of a Commission, that battle must be a separate issue from the LIS one.



# GASTON COUNTY

DIVISION OF PLANNING

P. O. Box 1578 - Gastonia, North Carolina 28053-1578 - Phone (704) 866-3195

August 10, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N. W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Sir:

Advances in computer and communication technologies have created a practical means for computers to readily exchange and compare data resulting in new concerns and benefits. A computer network can serve as a powerful communication medium among widely separated offices, but only if standards are established which accommodate computer interfacing and preserve data integrity. The following summary provides the relevant information and comments you requested to assist you in the development of the proposed "Land Information Systems".

- 1) Data Integrity (Standards): Each government agency would need the ability to access and backup updates or corrections quickly.
- 2) Security: A security system would be needed for authorization to access the network for protection from unauthorized changes and unauthorized users from viewing confidential information. This same security system should provide protection from computer viruses.
- 3) Maintenance: A maintenance program at the Federal level should be responsible for modifications and future needs. Responsibilities for a backup system should be at all levels of government.
- 4) Management: One central location? Or Hierarchical?
- 5) Start up costs: Each government agency would need the Federal level to assume a high percentage of the cost of purchasing the hardware and software needed to network.
- 6) Existing database: Federal funding would be needed for conversion programs for existing data to be converted into a compatible format for networking.
- 7) Control of database: Each government agency should maintain and control its own database.

There are several benefits of a computer network. Greater efficiency of time and cost of generating reports will increase since the reports will be analyzed from current records and unnecessary duplication of data.

Gaston County is currently building a database for the geographic information system which is built on hardware by Convergent Technology and mapping software by Manatron, Inc. The long term goals of the records management function involves record systems related to tax parcels, land use, zoning, orthophoto base maps, emergency response network, topographical mapping, water and sewer systems, hazardous substance storage, and other land records data. We have completed layers for landuse parcels and soils and are currently working on topographical mapping and streets and roads. We would like to provide a comprehensive research and recording function for other agencies and the general public. At present, Gaston County's geographic information system is not compatible to any municipality within the county nor is it compatible to any geographic information system at the State level.

Sincerely,

*Kathleen M. Raymer*

Kathleen M. Raymer  
Land Records Coordinator

cc: Mr. Phillip L. Hinely, County Manager  
Mr. Larry E. Hurlocker, Planning Administrator



**STANLEY ENGINEERING, INC.**  
SURVEYORS  
CIVIL ENGINEERS

TELEPHONE (401) 434-0134 — 33 ALEXANDER AVENUE — EAST PROVIDENCE, R.I. 02914

August 11, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Attention: Pat Korp

Dear Pat Korp:

I have reviewed the "Initial Draft" of the Land Information Study.

The report at this time is satisfactory what disturbs me is that:

1. Base maps are being prepared which are not done to the accuracy that is needed.
- a. Base maps should be prepared with proper ground control, not enlargements of G.S. Sheets, etc. which is now being done in some locations.
2. I do not believe an uniform single scale maybe used to satisfaction in all locations (areas), to properly show the information needed.
- I may have more comments at a later date.

Very truly yours,  
STANLEY ENGINEERING, INC.

*Ellsworth V. Stanley*  
Ellsworth V. Stanley  
Treasurer

cc: James Clapp



**P O L K C O U N T Y**  
BARTOW, FLORIDA 33830

**E. D. "BUD" DIXON**

CLERK OF THE CIRCUIT COURT AND COUNTY COURT  
OFFICIAL RECORDS DEPARTMENT  
INDEXING - RECORDING - TAX DEEDS  
DRAWER NUMBER CC-4  
P.O. BOX 9000  
BARTOW, FLORIDA 33900-0000

August 8, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Gentlemen:

As the Official Recorder in Polk County, pursuant to Chapter 28.222, F.S., this office accepts documents for recordation in the "Official Records" which includes real property conveyances.

Each instrument filed for record is indexed both direct and inverse and a general alphabetical index (cross referenced) is maintained on all instruments. This index is updated on a daily basis. Our computerized indexing program allows us to produce a separate deed report which lists real property conveyances.

Also, a copy of each conveyance is provided to our Property Appraiser's office as required by law. This copy enables them to update assessments on the tax roll.

Only private title companies in this county maintain a chain-of-title record as to a given legal description.

If further information is needed, please let me know.

Very truly yours,

*E. D. "Bud" Dixon*

E. D. "BUD" DIXON  
CLERK OF THE CIRCUIT COURT AND COUNTY COURT

EDBD:jc

**MARALEE I. LINDLEY**  
**SANGAMON COUNTY CLERK**

COUNTY BUILDING - ROOM 101  
SPRINGFIELD, ILLINOIS 62701  
TELEPHONE 217-753-4700



August 10, 1989

Mr. John Moeller  
Acting Assistant Director  
Support Services  
U. S. Department of the Interior  
Bureau of Land Management  
Washington, D. C. 20240

Dear Mr. Moeller:

Your "Initial Draft" of the Executive Summary of the Land Information Study (LIS) was received by me several weeks ago. I have reviewed the study and am sending my comments as you requested.

The LIS without a doubt is greatly needed. The entire large subject surrounding the LIS is of great importance to all levels of government--Federal, State, and Local. Your points in your document are certainly well taken. Land information is indeed a national asset. It is true that this information which is definitely in existence is certainly difficult to retrieve efficiently and, as you stated, often impossible to relate to relevant information in other land information files.

As the Sangamon County Clerk and Capital Township Assessor, I am very well aware of the difficulty when faced with the creation of an LIS. As you so well stated, many of the agencies duplicate information and present information in a wide variety of very dissimilar forms.

Your analysis is in my estimation very correct in that the LIS greatest task is to link the great multitude of very different sources, agencies, and geographic locations, and link them in a meaningful way.

I also agree with your study that the state role in land information is a key link in our highly decentralized intergovernmental system. Illinois has an extremely highly decentralized intra-governmental system. As you mentioned, the local governments do have primary responsibility for land record maintenance and indeed the state must play a responsible role in any attempt to unify a land information system.

As you mentioned, local governments, specifically in Illinois, manage the greatest amount of land information at the parcel level. As local governments provide most services to the public, so the needs of local governments in this endeavor are, in my estimation, imperative.

-2-

Undoubtedly standards must be designed, and when designed, must provide a way to adequately test the parcel-based land information that is available at the local government level.

In your report you also state that land information has value in the marketplace and is perceived as a capital resource. I concur that information is indeed an investment and an essential tool for disseminating information and a means for better management of tangible resources.

Your recommendations: a common approach, standards, education, funding focus, and coordination set the scene for a comprehensive network of LIS.

Your effort and your summary directive are to be commended as the beginning step in an important nationwide project. It is indeed a huge job but certainly within the scope of possibility. My personal opinion would be to have an overall national goal with focal points for overseeing within the states and enormous effort for involvement of the very important role of local governments in this effort.

Our county land information system basically functions primarily for county and township needs. At present we have on computer the listing of each parcel of land in Sangamon County on an overall real estate software system. The reports generated by this software are available and used by various local governments in relation to their specific needs. There is an enormous amount of data available regarding the land, and the software is updated and redone from time to time to make specific information available for the various units of local government as needed. I am sure there are many aspects of land information that could be provided from our basic data if a land information management system was created. At present our use of land information is for specific entities charged with statutory responsibilities. Undoubtedly, this information could be used in a variety of more sophisticated ways. To my knowledge, most of the exchange of land information in Sangamon County concerns the local government units.

Thank you for including me in your LIS executive summary, and please know that I will be happy to cooperate and work toward this effort. Let me know if I can be of service.

Sincerely,

A handwritten signature in cursive script that reads "Maralee I. Lindley".

Maralee I. Lindley  
Sangamon County Clerk

MIL/mh

COUNTY OF RIVERSIDE  
OFFICE OF THE ASSESSOR

COUNTY ADMINISTRATIVE CENTER  
4080 Lemon Street  
Riverside, CA 92501-3659  
(714) 787-6331

August 8, 1989

John Moeller, Acting Assistant Director  
Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th and C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

Your material on the Land Information Study was forwarded to me by the National Association of Counties recently. The Assessor is a major player in the development of a Geographical Information System for Riverside County, along with the Road Commissioner, the Planning Director, and the County Administrative Officer. The foundation of our system is the Assessor's parcel maps, which are to be tied to the California State Plane Coordinate System. We are using ARC/INFO software provided by ESRI of Redlands, California on a separate Data-General computer; this computer is linked to the property tax data base where the Assessor's records are located.

While a substantial amount of money has been spent, and quite a bit of equipment has been obtained, along with personnel to work on the system, several years will pass before the almost 10,000 square miles of our county are on the complete system. Pilot projects have proved that the system works, but all sorts of current needs, such as growth management, tend to preempt the incomplete system and to delay extending its complete implementation.

The Assessor's principal representative on our GIS team has two comments to share with you:

- 1) Land Information Systems have two main components:
  - a) Spatial Data (Graphics)
  - b) Attribute Data (e.g. Land Use, etc.)Spatial data must be linked through a common coordinate system (geodetic control) that will provide a standard geographic locator.
- Attribute data must include some common link that will relate to the spatial data (e.g. a parcel).

Frank C. Seeley, Assessor

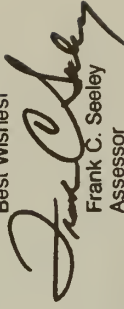
Richard K. Lashbrook, Assistant

John Moeller  
Page 2  
August 8, 1989

- 2) A funding mechanism is needed to insure the successful implementation of such a network of land information systems. Funding would encourage involvement and would give an incentive for sharing data.

Needless to say, we would be pleased to receive additional information from you as your program progresses. Any information about possible sources of funding would be particularly welcome. Please send me a draft copy of the entire report.

Best Wishes!



Frank C. Seeley  
Assessor

FCS:bh

Enclosures

P.S. A copy of some details of the Riverside County Land Information System is enclosed.





August 10, 1989

OFFICE OF COMPUTER SERVICES  
AND INFORMATION SYSTEMS  
5080 S.W. 87 AVENUE  
MIAMI, FLORIDA 33173  
(305) 598-8200

Letter to Mr. John P. Moeller  
Department of Interior

- 2 -

August 10, 1989

We feel that GIS is a very effective tool in areas such as: automation of the mapping process, data duplication reduction, timeliness of updates of informational material, availability and ready access to multiple layers of information. It is evident that GIS will reduce costs and facilitate communication among County departments.

Please feel free to contact us for any further input to the LIS Study from a local government perspective.

Dear Mr. Moeller:

We have reviewed the DRAFT Executive Summary on the Study of Land Information Systems. We found it to be a very thorough and comprehensive study.

Metropolitan Dade County is presently in the development phase of an automated Geographic Information System (GIS), which will provide a single source for accessing all of the County's Geo-based data. Following is a sample of the applications that can be developed for the various County departments using GIS:

- Building & Zoning - Hearing Notifications, Zoning Maps, Development Analyses, Inspector Routings.
- Highway Planning - Subdivision or Residential Impact Studies.
- Parks & Recreation - Location and Management of Facilities.
- Property Appraiser - Ownership Maps, Sales Analyses, Appraisals.
- Waste Department - Route Distributions, Dump Locations, Routing.
- Water & Sewer - Water and Sewer Main Atlases, Maintenance Scheduling, Service Area Analyses.
- DERM - Waste and WASAD data access, Environmental Management.
- FIRE - Hazardous Material Storage Locations, Incident Management.
- MDPD - Accurate Crime Analyses, Incident Management.
- GSA - Property Management, Shop Locations.
- Planning - County Development Planning.
- Emergency Management - Shelter Locations, Evacuation Routes.
- School Board - School Locations, Development Planning.
- MDTA - Riderhip and Route Analyses, Bust Stop Locations.
- Elections - Registration/Migration Analyses, Reprecincting.
- Public Works - Signals and Signs, Road Maintenance.

Sincerely,

Manuel Garcia, Director  
O.C.S.I.S.

MG/es

vpc: 8.4/89



## PASCO COUNTY, FLORIDA

DADE CITY (904) 521-4274  
NEW PORT RICHEY (813) 847-8140

ENGINEERING SERVICES DEPT.  
PASCO COUNTY GOVT. COMPLEX  
7432 LITTLE ROAD  
NEW PORT RICHEY, FL 34654

August 9, 1989

United States Department of the Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building, Room 5622  
Washington, DC 20240

Attn: John Moeller

RE: "A Study of Land Information Systems"

Dear Mr. Moeller

In response to the letter of July 26, 1989, from the National Association of Counties, we have reviewed the "Initial Draft" of the Executive Summary of the Land Information System. As per their request, the following are comments on how land information systems function in Pasco County, Florida.

The Geographic Information System (G.I.S.) of Pasco County is currently in it's infancy. The implementation schedule is attached. The County is still accumulating data through various internal agency files and creating "layers". It is felt that the completion of each layer is necessary before analysis can begin.

A parcel layer is being developed by the property appraiser's staff and introduced into the system through COGO or geometric means. The considerable time spent developing the parcel layer through this method is viewed as the most efficient for future usage. Analysis of conflicting descriptions, square footage of zonings and land use can readily be performed through the mathematics of Cogo. The parcel layer has a unique identification number for each parcel throughout the County.

State Plane coordinates are used where they are currently available. Thus enabling easy computation, common control points, easy verification of apparent conflicts. It is proposed that acquisition of missing coordinates be accomplished through G.P.S. methods with consideration given to the 83' datum.

United States Department of the Interior  
Washington, DC 20240  
August 9, 1989

-2-

The development of the natural features layer and the implementation of a comprehensive land use plan is a function of the G.I.S. system. This particular layer is useful for pre and post development analysis. Currently, approximately 75% of the natural features layer is complete.

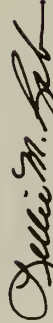
Cooperation with area planning agencies and water management districts has resulted in a cost effective measure for the acquisition of mutually interested data. The exchange of data beyond a regional or area level has not transpired at this time.

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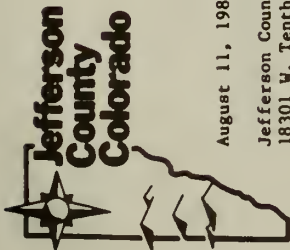
If you have any questions, or require further information, please do not hesitate to contact this office.

Sincerely,

  
Nellie M. Robinson, P.L.S.  
G.I.S. Administrator

NMR/dem

cc: National Association of Counties  
440 First St N.W., Washington, DC 20001



BOARD OF COUNTY COMMISSIONERS

RICH FERDINANDSEN  
District No. 1  
MARJORIE E. CLEMENT  
District No. 2  
JOHN P. STONE  
District No. 3

August 11, 1989

Jefferson County Mapping Department  
18301 W. Tenth Avenue Suite 260  
Golden, Co. 80401

John Moeller, Chairman  
BLM Core Study Team  
U.S. Dept. of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington D.C. 20240

Dear John:

As Director of the Jefferson County Mapping Department, I am responsible for the creation of an automated land information system to support a county-wide GIS. I am responding at the request of the National Association of Counties to comment on the Study of Land Information (BLM) in response to Public Law 100-409.

While I have the above responsibilities, I have also served as a county representative on the professional societies Ad Hoc Committee chaired by Jim Clapp. I had the privilege to interject considerable input through the committee; however, I have a few concerns from the county standpoint that did not prevail during the committee discussions and wish to bring this to your attention.

I feel the report is a very good document responding to the concerns for possible improvement in the handling of information related to Federal and other lands. My disappointment is in the final recommendation. I feel specific legislation should be proposed to create the single Federal agency and a Federal Commission. The commission's authority should include choosing the director of the Federal agency and approving his organizational structure. That authority should be limited to a reasonable time frame and then the committee be retained as an advisory committee only and the authority transferred to the agency upon implementation. The composition of the commission should be as defined in the final recommendation.

The legislation should include specific requirements for state and local focal point involvement, possibly through a funding situation. The focal point must be defined at each local and state entity before they could receive funding or technical assistance from the Federal government.

Funding should probably be limited to no more than one-half the cost of the individual project. The need for the land information system is being created by local usage and necessity as defined in the report.

Thank you for considering my comments.

Sincerely,

Billie C. Swenson  
Director of Mapping

/sll

c: Norman Allen, Jefferson County Clerk and Recorder  
Donald E. Cluxton, Jefferson County Administrator  
John P. Thomas, Executive Director, National Association of Counties



Center for Mapping  
The Ohio State University  
404 Cockins Hall  
1958 Neil Avenue  
Columbus, OH 43210-1247  
Phone 614-292-6642

Page 2  
August 11, 1989

August 11, 1989

Mr. John Moeller  
Acting Assistant Director, Support Systems  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

I have reviewed, with interest, your draft report mandated by Section 8 of Public Law 100-409. Clearly, the general thrust and philosophy of the report is in keeping with everything I know about the overall problem.

I believe that many of my colleagues, who have helped write the NAS/NRC report on the multi-purpose cadastral or who have been involved for ten or more years in this business, will be frustrated with this report. This is because the report reflects and even points out that nothing (basically) has been done to solve a problem that was understood in the mid-70's.

In addition to the above general comment, the following specific points are submitted in an attempt to improve the report.

1. There is little (or no) mention of research. Shouldn't this be under "recognized needs" on page 5? I assume the committee agrees that there are research needs, such as an examination of longer term issues and the needs for a research funding mechanism, etc.
2. It would be helpful if there would be a discussion of "what are the hardware and software requirements for a computer assisted LIS?" At least this should be covered in a general way. This would then provide a distinction between this report and the NAS/NRC MPC report.
3. While a commission is better than nothing, a new agency is a better solution. However, I do not believe this is

the forum to stress this point unless a great deal of political groundwork is accomplished beforehand. If that could be accomplished, a major contribution would be made.

4. Collecting all the data from the parcel level upward is an enormous task. A cooperative method for accomplishing this is the only possible way to do it. This method should be well defined in the document. Examples of this method are the North Carolina "dollars for specifications" model, the USGS/NMD cooperative model for digitizing quadrangle sheets, etc.
5. The examples chosen, both nationally and internationally, are not the best ones possible, e.g. why not Australia in the list of countries "establishing LIS". Some U.S. examples are the antithesis of what we should do!

I hope these comments are helpful. I have made a few comments in the margin of the document. As is, it is well written, clear and reinforces our beliefs.

Sincerely,

John D. Bossler  
Director

CW

cc: Tom Baerwald, NSF



NASSAU COUNTY PLANNING COMMISSION

400 COUNTY SEAT DRIVE  
MINEOLA, N.Y. 11501-4825  
516-535-5644

HERBERT LIBERT  
DIRECTOR  
LLOYD SMALLWOOD, JR.  
CHAIRMAN

Mr. John Moeller  
U. S. Department of the Interior

P. 2  
August 10, 1989

August 10, 1989

Mr. John Moeller  
U. S. Department of the Interior  
Bureau of Land Management  
18th and C Streets, N. W.  
Main Interior Building (Room 5622)  
Washington, D. C. 20240

Dear Mr. Moeller:

Nassau County, located on Long Island, is a suburban, New York county with a population slightly in excess of 1.3 million people. It is one of the most affluent counties in the country and, yet, its land information system is far from the "land information systems" described in "A Study of Land Information Systems: A Draft Executive Summary".

Presently, the County's Assessment Department has all property records computerized on a section, block and lot basis. The system is quite extensive and is utilized by several County departments from time to time. The County is considering establishing a geoprocessing system to be sponsored by the Department of Public Works and to be shared by a number of agencies. A summary of the proposal is attached. There has been talk of moving into a system like this for many years, but no progress was ever made beyond the talking stage, due to skepticism about actual "need", high cost and uncertainty about what system to acquire.

There is no guarantee that the proposed system will be approved and implemented in the near future. However, key officials are beginning to talk seriously about moving to such a system. Other levels of government in the County, including 64 villages, three towns and two cities, would be able to share the data in the system.

The point here is that if a County like Nassau is having this much difficulty in first finding a system to utilize and then paying for it, the situation in the rest of the country could be in much worse shape. We wonder how less affluent areas can even entertain the thought of moving toward a land information system at all.

Currently, each governmental entity is on its own in choosing what elements to include in a land information system. If the intent is to make the system compatible, the Department of the Interior must complete its study quickly before various governments make decisions committing themselves to systems that may prove to be incompatible or incomplete. After spending large sums of money for a particular system, governments may later feel pressure to modify a system, or convert to a standard system, perhaps at great cost. It may be prudent for governments to hold off in moving to such systems, if a standardized system is to be a reality.

Nassau County would be most interested to learn when this study is expected to be completed. It is an ambitious effort. Governments need guidance as quickly as possible as to what should be included in a land information system, and how to keep the cost to a minimum.

We would be pleased to cooperate further in the development of your Land Information Study, and would appreciate receiving a copy of the draft report when it is completed.

Sincerely yours,

*(Signature)*  
JOHN W. FOLLISS, JR.  
Deputy Director

JWF/fp  
enc.



SECRETARIA DE PROGRAMACION  
Y PRESUPUESTO

INSTITUTO NACIONAL DE ESTADISTICA  
GEOGRAFIA E INFORMATICA  
DIRECCION GENERAL DE GEOGRAFIA

Oficio No. 89/720.-105

México, D. F., 27 de julio de 1989  
EL INEGI A SU NUEVA SEDE EN AGUAS-  
CALIENTES: UN PROCESO EN MARCHA

México, D.F., July 27, 1989

SR. JOHN MOELLER  
Acting Assistant Director  
Support Services  
Bureau of Land Management  
United States Department of The Interior  
Washington, D.C. 20240  
U.S.A.

MR. JOHN MOELLER  
Acting Assistant Director  
Support Services  
Bureau of Land Management  
United States Department of The Interior  
Washington, D.C. 20240  
U.S.A.

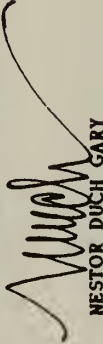
Acuso recibo de su atento comu-  
cado de fecha 14 del presente, y le agradezco cumplidamente el re-  
sumen del Estudio que con él ha tenido la gentileza de enviarme; -  
mismo que ha resultado de nuestro positivo interés.

I am referring to your communication  
dated July 14, and duly thanking you for the abstract of the  
Study you kindly enclosed, which has been of positive interest tous


atención, quedo de usted.  
Con nuestro reconocimiento a su

With our acknowledgment to your attention,  
I remain sincerely yours.

A t e n t a m e n t e  
SUFRAGIO EFECTIVO. NO REELECCION  
EL DIRECTOR GENERAL



NESTOR DUCH GARY



NESTOR DUCH GARY  
General Director

NDG/rms



United States Department of the Interior  
MINERALS MANAGEMENT SERVICE  
WASHINGTON, DC 20240

AUG 14 1989

Mr. John Moeller  
Acting Assistant Director, Support Services  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

We appreciate the opportunity to review the Draft Executive Summary of "A Study of Land Information Systems" and to offer our comments on it. We strongly suggest that Offshore Coastal Zone information be included in the database.

Your approach to the analysis of this problem is well reasoned and long overdue. As we have just received a draft copy of the entire report, we expect to make an indepth review and offer specific, detailed comments at a later date.

Sincerely,

John B. Trippe  
Manager  
Offshore Systems Center

ASSESSOR'S OFFICE  
County of Forsyth



August 9, 1989

Mr. John Moeller  
18th & C Street, N. W.  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Mr. Moeller:

In response to your letter of July 14, 1989, I have reviewed the Draft of the Executive Summary of the Land Information Study. I have also passed this document along to my supervisor, Harold Renfro, for review and comment.

It is encouraging to see the effort being put in to this endeavor. It should be stressed that essential to the development of a successful LIS at any level other than the single user is the development and use of a digital cartographic data transfer standard. In our opinion this part of the overall standard is the principal missing element. There is a proliferation of GIS systems on the market and the number of users will drastically increase in the near future. This makes for the certainty of having a very large number of incompatible system-user combinations. A "Tower of Babel" - like situation in the LIS world if these systems do not communicate well with each other. It is our understanding that this part of the standard has not been extensively researched by vendors. We recommend that a strong statement be used to promote the eventual adoption and use of a digital cartographic data transfer standard by vendors and users.

If I or Mr. Renfro can be of further service, please contact us in the Forsyth County Tax Assessor's Office at (919) 727-2658.

Sincerely,

Angela Holder-Pearman, Shift Leader  
Mapping Department

cc: John P. Thomas, Executive Director  
National Association of Counties



JANE LICHT

# Dane County Register of Deeds

DEPUTIES  
Darlene Duckert  
Lila Eid  
Barbara Olverson  
Joyce Smith  
Karen Subera

August 10, 1989

John P. Thomas  
NACo Executive Director  
440 First Street NW  
Washington DC 20001

Dear Mr. Thomas:

In response to your request for information about our land information systems here in Dane County, Wisconsin, I would say that we are at present isolated, non communicative, decentralized, and in many respects have not progressed very far from the days of Thomas Jefferson. However, interest, committee work and pilot projects abound in Wisconsin. At the urging of a state-wide group of land records professionals, the Wisconsin Land Information Association, our legislature recently adopted land records legislation to promote modernization, standardization and the sharing of data between the various government levels and the private sector. The final report of the Wisconsin Land Records Committee (1987) influenced this new land records program recently signed into law.

However, it will be some time before a user fee and method of distribution of funds to support modernization will be established and affect our budget process here at the county level.

Within Dane County, our land records offices do not communicate electronically. Our Land Conservation Department has cooperated with the University of Wisconsin and the CONSDIL project funded by the Soil Conservation Service, so that county department is the farthest ahead in land records modernization. A geographic information system (GIS) has been established there and used to complete the soil erosion control plan, and for conservation planning with farmers. Our County Conservationist wished that our Surveyor's remonumentation program and digitization of the parcel mapping layer would have been completed, but since our county is still lagging in that area, our County Conservationist

digitized farm field boundaries himself. It is not an accurate parcel layer and will have to be redone, but it was sufficient for natural resource planning purposes.

In my particular office we enter information into a ten-year old computer system to generate indexes for finding real estate documents. We send out the computer tapes to a firm which produces the indexes on microfiche. Our system is good for input but unfortunately, we cannot access information directly using a computer terminal. Additionally, we have to send individuals all over the county court house for information on land--to the surveyor, zoning division, plat review, tax lister, treasurer, clerk of courts--when it would be so convenient to have all land-related information on a common base. A customer should be able to enter the unique parcel identification number on a terminal in any of the land records offices and find all the pertinent and timely pieces of public information about that parcel of land.

For the last four years, I have served as a Governor's appointee to the state Land Conservation Board. It has come to my attention that our Department of Natural Resources (DNR) has mapped the Wisconsin wetlands and now the Soil Conservation Service is remapping them. Unfortunately, when the DNR put our wetlands on a digital base, they did not link the maps to the Public Land Survey System (PLSS) so the maps are essentially floating in space and cannot be accurately related to other maps which have a fairly accurate parcel base. I certainly hope SCS does not make the same mistake. "Quick and dirty" methods which only address the immediate mandate end up costing tax payers again and again.

Enclosed are some articles that may be of interest to you. I am very pleased that NACo is becoming involved in this important issue.

Yours truly,

Jane Licht



Manuel J. Maloof  
Chief Executive Officer

August 15, 1989

Mr. John Moeller  
U. S. Department of Land Management (840)  
18th and C. Street, NW  
Main Interior Building - Room 5622  
Washington, DC 20240

Dear Mr. Moeller:

The draft Executive Summary of A Study of Land Information Systems presents a well written and thought out argument for the standardization of land data collection at all levels of government. It is very timely as the interest in the use of computers for mapping and data collections is increasing rapidly as evidenced in the growing membership of the Urban Regional Information Systems Association (URISA) over the past five years.

DeKalb County, Georgia, is currently in the process of developing a computer mapping program that will allow various departments to access a variety of information. In this process, we have seen the problems that occur when the standards differ from jurisdiction to jurisdiction. It makes it difficult to share data of meaningful substance with each other. It also makes it difficult to integrate research already done by other private companies and public agencies. This was evident when DeKalb County began to consider the move to computerized maps. We contacted various state agencies and public utilities to see what they were using. One logical basis for maps is the road system; therefore, a system was selected that was compatible with that used by the Georgia Department of Transportation.

In the past, DeKalb County, as most other counties in the state, maintained by hand all data on cards in the Tax Assessors office or in other departments. Presently, all tax information on the approximately 171,000 parcels in the county is recorded in the computer using a program called OASIS. Previously, maps were also maintained by hand but are now being converted to a CAD system. Eventually, these two systems will be combined to graphically provide data on each parcel in the county.

Mr. John Moeller  
August 15, 1989

2.

Presently, there are few data sources that have common identifiers either in the Atlanta metro area or the state. All parcels in the state are identified by district and land lot, but that is all that is common from one jurisdiction to the next. There are state plane coordinates and benchmarks which are not currently required to be recorded with surveys, thus losing that common reference point.

The adoption of standards and the encouragement of private software and hardware companies to develop compatible programs and machines that would allow easy access to this standardized data would greatly facilitate land information management at all levels of government. We agree that the focus of any program should be the coordination and utilization, as much as possible, of existing standards. Also, it would be sensitive to all potential users - public and private.

As for the best way to do this, we would encourage your department to develop a method that would require the least amount of personnel from all government agencies.

Thank you for the opportunity to respond to this important project.

Sincerely,

Manuel J. Maloof  
Chief Executive Officer

MJM/jlh

cc: McMillian C. Baggett, Planning Director

JOHN ASHCROFT  
Governor

G. TRACY MIFIAN III  
Deputy



Division of Energy  
Division of Environmental Quality  
Division of Geology and Land Survey  
Division of Management Services  
Division of Parks, Recreation  
and Historic Preservation

STATE OF MISSOURI  
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGY AND LAND SURVEY  
P.O. Box 250, 111 Fairgrounds Road  
Rolla, MO 65401  
314-364 1752

August 15, 1989

United States Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Gentlemen:

I appreciate the opportunity to comment on your draft report, Study of Land Information. I concur one hundred percent with the recommendations of the study team. The five areas of need: A common approach to structuring, standards and guidelines, coordination, focus for funding and education, are truly areas that need to be covered. In my capacity as the State Land Surveyor of Missouri we are working to provide the basic geographic reference system for the development of local land information system. All our work is based on FCC standards, and we are becoming fairly successful in providing information for the development of local systems.

There seems to be a considerable difference, even in the approach that the various states are taking in the development of a well monumented geographic reference system. It is very important that a common information system concept be developed and that there be coordination not only between the federal government but the states and local agencies as well. If we are not careful, every state will have a different geographic reference system and every local governmental entity will have their own land information system without the ability to aggregate the local systems to the state and national level.

In the last year I have begun to see a strong movement towards the development of local land information system in Missouri. This will continue if the funds are available at the local level. In the State of Missouri, and I presume in many other states, there is no coordinated effort to provide for the

August 15, 1989  
Page Two

aggregation of these local systems into a statewide system. The state level systems will not fit into the national system. Obviously this lack of coordination and guidance can be very costly in the long run.

I would like to see the Study Committee's recommendations go forward as quickly as possible. I would urge you to draft the legislation needed for the creation of a commission. I would hope that commission will be composed of state and local members so that the system and coordination will filter down very rapidly to the state and local level.

The American Association of State Surveyors is composed of fifteen state level organizations dealing with both cadastral and control surveying. Members of this organization will be meeting on September 22, 1989. I will certainly bring this document and these recommendations to their attention. I believe that they also will support your recommendations wholeheartedly and in particular, any future legislation needed to create the coordinating commission.

Thank you very much for the opportunity to comment.

Sincerely,

MISSOURI LAND SURVEY PROGRAM

Robert E. Myers, P.E., L.S.  
State Land Surveyor

REM:gjh

cc: Mr. James P. Weidener  
Representative Harold Volkmer



## NORTH CAROLINA ASSOCIATION OF COUNTY COMMISSIONERS

ALBERT COMES LOCAL GOVERNMENT CENTER • 215 NORTH DAWSON STREET  
P. O. BOX 1488, RALEIGH, NORTH CAROLINA 27602-1488 • TELEPHONE 919/832-2983

August 15, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, NW  
Main Interior Building - Room 5622  
Washington, DC 20240

RE: July 14, 1989

Dear Sir:

The North Carolina Association of County Commissioners is in general agreement with the conclusions and recommendations in your study about possible improvements in the handling of information related to Federal and other lands. Although only about seven percent of North Carolina land is in Federal ownership, a role for Federal land information involvement certainly exists in our State as it probably does in other states. The Federal government is the largest single landowner in a number of our counties, and in several counties, the Federal government owns more than half of the land. Consequently, the potential exists for land information management and coordination at and between the Federal, State and local levels.

County governments in North Carolina have been very fortunate in that we currently have a State program which has established a common land information system approach at the State and local levels - this program is the North Carolina Land Records Management Program (LRMP). North Carolina was the first state to institute a program to create a state/local approach to land records and land information management. In 1977, the North Carolina General Assembly established the LRMP with the express purpose of improving land records and land information. As a result, over seventy percent of North Carolina counties are now in the process of or have completed mapping their counties with modern, orthophoto based, multi-purpose cadastral maps. Within the next several years, all register of deeds offices in the state will be following uniform standards for collecting, formatting, and storing land records and land information. Since the inception of this program, several other states have developed similar programs using North Carolina as a model.

U.S. Department of Interior  
August 15, 1989  
Page 2

Our Association endorses the concept that Federal, state, and local governments form a partnership to coordinate and improve land information systems. We agree that a Federal agency/commission should be established to coordinate Federal LIS activities, provide general guidance for state and local activities, help insure compatibility among the states, and provide incentives for state and local activities. State government, as in the case of our LRMP, should provide leadership and uniformity at the state level. Local governments should continue their traditional role of collecting, storing and disseminating parcel level land information. Within this context, we feel that no single member of a Federal, state, local government land information partnership should have the ability to decide unilaterally the form of such an information system or the roles the partners would play in the system.

Because of the knowledge that the North Carolina Land Records Management Program has gained and the progress that has been made in the twelve years of its existence, we would encourage a Federal LIS commission to become familiar with the North Carolina approach to land records/land information. This type of review would allow such a commission to experience a functioning program that is dealing with many of the same issues, problems, and goals that are envisioned for the commission.

Please contact me if you have any questions about the North Carolina land information system approach or if I may be of service in your efforts to improve the handling of information related to Federal and other lands.

Yours very truly,

*C. Ronald Aycock*  
C. Ronald Aycock  
Executive Director

cc: Mr. John Thomas, NACO  
Interior/CRAI

# ACSM - ASPRS

American Congress on Surveying and Mapping  
American Society for Photogrammetry and Remote Sensing  
210 Little Falls Street • Falls Church, VA 22048  
ACSM [703] 241-2446 • ASPRS [703] 534-6617

August 16, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Attn: Ms. Pat Korp

Dear Ms. Korp:

Enclosed are comments on the Executive Summary of the Federal Land Information Study by the Joint Government Affairs Committee of the American Congress on Surveying and Mapping and the American Society on Photogrammetry and Remote Sensing.

In general, the committee is supportive of the study's findings and recommendations. We applaud the cooperative efforts among the interested groups within the federal, state and local governments and the private sector in developing the report. We hope that the groups involved in the study will continue their efforts to assure that the study recommendations will be implemented.

Most of our suggested revisions to the draft are minor, with one exception. We would like more emphasis placed on implementing previous study recommendations which called for the formulation of a single civilian surveying and mapping agency. We believe such an agency is essential to the development of compatible land information systems. We hope that the Core Team will recommend in its final study report that a plan be devised to implement a single civilian agency.

Thank you for your interest in our comments. We appreciate the opportunity to review the study and wish the Bureau of Land Management every success in implementing the recommendations to attain compatible land information systems in this country.

Sincerely,

*Robert W. Foster*

Robert W. Foster  
Chairman  
Joint Government Affairs Committee  
ACSM/ASPRS

Enclosure (1)

## THE JOINT GOVERNMENT AFFAIRS COMMITTEE COMMENTS ON THE DRAFT EXECUTIVE SUMMARY

### OF THE FEDERAL LAND INFORMATION STUDY

AUGUST 15, 1989

The Joint Government Affairs Committee (JGAC) of the American Congress on Surveying and Mapping (ACSM) and the American Society for Photogrammetry and Remote Sensing (ASPRS) appreciate the opportunity to comment on the Draft Executive Summary of the Federal Land Information Study.

The JGAC through its direction of the societies' government affairs program strongly advocated congressional enactment of the Federal Land Information Study in Public Law 100-409. The Committee was instrumental in obtaining Senate report language in the legislative history of the law. The Senate report language provided the platform for ACSM and ASPRS to assemble an Ad Hoc group to represent professional societies and organizations in both public and private sector surveying, mapping and related fields in the study. Because of the JGAC's previous legislative involvement and its interest in this study, we offer the following recommendations for your consideration in the final study report:

#### Introduction - Page 1

We suggest that the introduction include a short discussion of why Congress is concerned with the land information issue. There should be a paragraph indicating that Congress recognized that this is an important issue which needs to be addressed; that Congress has explored this problem to a great extent in previous studies; that recommendations from previous studies need to be implemented; and that the feasibility of creating a single federal civilian surveying and mapping agency had been favorably recommended by previous studies and various initiatives had been undertaken by Congress and the Executive Branch of the government.

Study Approach - Page 1

The full text of the topics from Section 8 of the statute should be reiterated. By shortening the topics the intent appears to be weakened.

Team Composition and Consultation - Page 1

We would like the Ad Hoc Committee capitalized and suggest the following: "and an Ad Hoc Committee organized by the American Congress on Surveying and Mapping and the American Society for Photogrammetry and Remote Sensing to represent professional societies and organizations in both public and private surveying, mapping and related fields."

We also suggest that the names of the participating organizations in the Ad Hoc Committee be included in the appendix of the report.

Background - Pages 1 and 2

The reference to "Parade Magazine" should be eliminated. While the example illustrates the problem with evaluating land data, a more authoritative source should be used. We suggest either the original source of the data be researched and used or the paragraph be rephrased to indicate that the problem has captured the public's attention and this concern was recently noted in an article published in a well-known national Sunday newspaper supplement.

Previous Studies - Page 2

The JGAC believes that this section is too brief. It should summarize the conclusions and recommendations of the previous studies.

Ongoing Activities - Page 3

We suggest that the second paragraph provide some kind of sample or summary of the ongoing activities in case the reader does not look to the full text of the report.

Coordination and Roles/Responsibilities - Page 3

The paragraph dealing with the role of the private sector should be rewritten to include the following: "Private firms have made significant investments in equipment, personnel and training. The breadth of private sector skills is extensive and varied and the number of firms offering data collection and data management services is increasing. To the extent possible, governmental agencies should look to the private sector to draw upon its capabilities for developing/managing its land information systems. Since high quality data is essential for compatible land information systems in the public and private sectors, appropriate procedures need to be initiated to ensure that high quality data is collected and maintained."

RECOMMENDATIONS - Pages 5 and 6

The JGAC stressed the need for the recommendations to be more explicitly stated.

In the introductory section, we recommend the following:

There is a need for readily available geodetic, cadastral, and other management data, and a recognized need for:

- \* A comprehensive approach to land information systems
- \* National standards and guidelines
- \* Education, including training
- \* Coordination, Leadership, Authority, and a broad-based commitment
- \* A focus for funding

The last paragraph in the introductory section should be eliminated.

Land Information System Concept

The recommendation should be transferred from the first paragraph and listed at the end of the section.

Therefore, to provide a framework for establishing a common approach to land information management at the local, State and Federal levels of government, it is recommended that Congress pass legislation to establish the concept of a national integrated land information management systems policy.

Guidelines/Standards

The first sentence should be changed to add: that land information systems at various levels of government must provide for maximum data exchangeability.

Following the first paragraph, there should be the explicit recommendation.

Therefore it is recommended that:

Include as already specified in the report but add the following to the list of recommendations:

- \* Data quality and accuracy standards and guidelines be established.

Coordination and Responsibilities

The first paragraph should state that there is currently no organization or individual who has the responsibility or authority to implement the recommendations made in previous studies over the past 16 years or to coordinate activities.

We suggest a change in emphasis from the conclusions reached by the study team in this area. The JGAC recommends the following:

- \* That a plan to implement previous recommendations for a single civilian agency be formulated. The feasibility of such an agency has already been established through recommendations in three previous studies. The single civilian surveying and mapping agency would assimilate the surveying and mapping activities at the federal level. It would also serve to support the base reference system for LIS and coordinate LIS activities at all levels of the government and the private sector through an advisory committee. Such committee would consist of voting members from state and local governments and the private sector. Federal members would have a non-voting status.

The Office of Management and Budget should devise a plan to create the single civilian surveying and mapping agency. Such plan should include a consideration of: the institutional make-up; the mission; the advantages and disadvantages; and the potential cost savings to the government. Once developed this plan should be forwarded to Capitol Hill for action by the appropriate authorizing committees.

\* As an interim solution until a single civilian surveying and mapping agency can be established, the JGAC suggests that an LIS Commission be established. Such commission would provide leadership and coordination. It should have the requisite authority so it can provide the needed impetus for all levels of government and the private sector to develop a commitment to the land information system concept.

Note: Under this section, the last paragraph under the section from Education should be added.

Funding

After the first paragraph, the conclusions and recommendations should be stated.

Therefore, it is recommended that a funding strategy be developed which would address:

- \* Existing sources of funding...
- \* Funding of the LIS...
- \* Incentives for sharing...
- \* A commitment to a long...
- \* The distribution of ...

Education

We suggest that the last paragraph in Education referring to technical assistance be transferred to the section dealing with Coordination.

The recommendation should be specifically stated.

Therefore it is recommended that:

- \* There should be a procedure for...
- \* A mechanism should be established...



UNIVERSITY OF MAINE

Department of Surveying Engineering  
Center of Excellence in Land Information Studies

107 Boardman Hall  
Orono, Maine 04469-0110  
207/581-2188

August 14, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Committee:

Thank you for the opportunity to review the draft report, *A Study of Land Information*. The study provides a sound review of the issues and of current projects. I strongly support the five broad recommendation areas, however difficult they may be to implement in fact.

A few comments :

With respect to • geodetic control in the form of geographical or rectangular coordinates, I would suggest a modification. There has been recent interest on maintainance of measurements over coordinates. The importance of measurements has been illustrated by the recent datum change. I would emphasize, as part of the overall concept, a need to develop a measurement database. Such a database would provide the foundation for quality control and the derivation of coordinates. There were two papers at the recent URISA conference supporting this approach. I think this approach is worthy of attention and should be included in the report.

Also, with respect to the basic components, there should perhaps be an elaboration of the property boundary or cadastral information. By this do we mean the strict legal definition which may include all manner of gaps and overlaps or a cartographic and topologically consistent representation.

I was happy to see the emphasis on standards, which will be critical to the development of the Land Information System concept. One area which I did not see mentioned was standardization of statistical data collection units. I realize there are some tricky issues here, but lack of standards here creates the

inability to make comparisons over time. Standards in this area will be important to developing a commonly understood data model of the logical relationships among land entities. This could just be mentioned as another area for standards consideration.

As public funding for this undertaking may be in short supply at all levels of government, there might also be more emphasis on creative private industry partnerships.

These on some very quick reactions. On the whole, I strongly support this effort and would be happy to contribute in the future in any way.

Sincerely,

Kate Beard  
Assistant Professor  
Department of Surveying Engineering  
University of Maine

August 11, 1989

COMMENTS ON  
LIS DRAFT REPORT

The July 27, 1989 draft report on Land Information Systems adequately lists the many different users and generators of Land Information. One aspect of Land Information that was not addressed is the profound and fundamental difference between topographic information and real property boundaries. While both may (and ought to be) related to Geodetic Positioning, the reliability of topographic information is fundamentally a function of precision of measurement. Collection and presentation of topographic data is almost a pure science. This is not the case with real property boundaries.

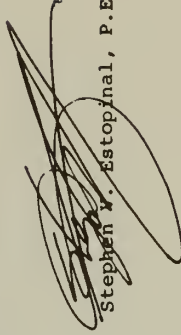
Land "Parcels" exist because of the concept of personal "ownership" of land. Of course, land can never be "owned" in the same sense that goods may be owned. A person can collect his "goods", even a house, and move it to another place. Goods can be consumed or destroyed, real property can not. Even if one were to remove as much soil as possible from a real property parcel, that parcel still exists. The thing "owned" in the possession of real property is a collection of intangible rights.

The right to go upon a portion of land and cultivate, build a domicile or business, refuse access by others, and a multitude of other rights is what constitutes real property ownership. The limits of these rights are real property boundaries. The instant owner's rights end another's begins. There are no gaps or overlaps in real property rights (although more than one individual may own the same right). These limits are imaginary and exist only in law. Physical objects may be used to locate to these imaginary boundaries. Corners may be monumented, fences may be erected and lines might be drawn upon paper to assist in the identification of a boundary but the boundary itself is as intangible as the rights that it limits.

For this reason, the collection and presentation of information pertaining to real property boundaries is much less a science than any other type of land information. The novice might believe that deed information reporting the size and shape of a real property parcel defines the limits of that parcel. Not so! Deed information exists to document and assist in the recovery of the location of real property boundaries. The shape and size of a real property parcel depends upon where the boundaries are actually located. Deed information, particularly old deed information, will frequently misrepresent the true configuration of a parcel and give the appearance of a gap or overlap between parcels.

Standards of practice and measurement procedures that produce excellent results in the sciences of topography, geodesy, and mapping will fail to address the fundamental demand of real property parcels. Real property boundaries need to be permanent, contiguous, definite, recoverable and unique in order to meet the needs of ownership. Any information system that is based upon real property parcels must be flexible enough to allow for modification and frequent updating of the parameters as deed information is improved. Parcels are often combined or divided into new parcels. This "recreation" of parcels also demands flexibility in the system that identifies land information based upon real property boundaries.

The fundamental challenge in any Land Information System is the inclusion of the tangible rights of real property ownership.



Stephen Y. Estopinal, P.E., P.L.S.



RANDALL L. ABBOTT  
DIRECTOR  
David Price III  
Assistant Director

2700 M Street  
Suite 100  
Bakersfield, CA 93301  
(805) 861-2615

## DEPARTMENT OF PLANNING AND DEVELOPMENT SERVICES

August 11, 1989

MR. JOHN MOELLER, Acting Assistant Director  
U.S. Department of Interior, Support Services  
Bureau of Land Management (840)  
18th & C Street, N. W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Re: Review of Initial Draft Executive Summary of the Land Information Study (LIS)

Dear Mr. Moeller:

Thank you for the opportunity to review and comment on the Initial Draft of the Executive Summary of the Land Information Study.

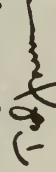
Kern County recognizes the need for a coordinated, comprehensive system of compiling land information for use by various levels of government. It is important to recognize that local governments may have incurred significant expense and staff resources in the development of their own land information systems. Every effort should be made to acknowledge the efforts of these local jurisdictions when developing a comprehensive land information system.

It is also important that the proposed commission to be established for facilitating coordination between various governmental agencies be represented by sufficient local jurisdictions to assure effective representation.

Once again, the Department appreciates the opportunity to comment on the scope and direction of this program.

Very truly yours,

RANDALL L. ABBOTT, Director  
Planning & Development Services

  
By: David Price III  
Planning Division Chief

RLA:TJ:ITK



GWINNETT COUNTY  
Department of Financial Services  
Tax Assessors Office

DATE: AUGUST 14, 1989

TO: U.S. DEPARTMENT OF INTERIOR  
BUREAU OF LAND MANAGEMENT (840)  
18TH & C. STREET, N.W.  
MAIN INTERIOR BUILDING - ROOM 5622  
WASHINGTON, DC 20240

FROM: STEVE WALLACE, APPRAISAL/MAPPING SYSTEMS MANAGER

SUBJECT: LIS

GWINNETT COUNTY IS A MANUAL MAPPING OPERATION PRESENTLY. WE TIE ALL PROPERTY DESCRIPTIONS TO OUR CURRENT LAND LOT SYSTEM.

WE ANTICIPATE THE INTEGRATION OF A GEOGRAPHICAL INFORMATION SYSTEM IN THE NEAR FUTURE. WE RECENTLY ACQUIRED AERIAL PHOTOGRAPHY AT 1"=200' SCALE. THIS MOVE TO 1"=200' FROM 1"=400' WILL ENABLE US TO START A REMAPPING PROGRAM.

YOUR DRAFT SEEMS TO BE VERY WELL STRUCTURED AND EXPRESSES ITS NEED FOR LIS.

76 LANGLEY DRIVE • LAWRENCEVILLE, GEORGIA 30245-6800



BRADLEY L. JACOBS  
COUNTY ASSESSOR  
TELEPHONE (714) 804-2727  
FAX (714) 558-0081

630 NORTH BROADWAY  
CIVIC CENTER PLAZA ENTRANCE  
P. O. BOX 149  
SANTA ANA, CA 92702

**County of Orange**  
OFFICE OF THE ASSESSOR

August 09, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Attention: John Moeller  
Gentlemen:

The initial draft of the Executive Summary of the land information study referred to in your letter dated July 14, 1989 has been examined by me. I can see the inter-relationships of these kinds of data throughout the country as more data becomes available. It's somewhat like Parkinson's First Law where work expands to consume the time available for its performance. Here analyses and power plays also will expand to consume whatever is available that they can work on. Therefore, I view this with mixed feelings.

Creating a federal surveying and mapping administration concerns me greatly. I don't know what this would do other than expand work to perpetuate its own existence and to be another WPA in modern dress. On the other hand, I think that communication and mutual helpfulness among possessors of data is appropriate for minimizing resources consumed. But, in the end my concern is that another centralized, czar-driven, empire-building consumption of taxpayers' money is not a high priority item in this era of scarce resources. And, I think the biggest drawback is that the agency being proposed to house computer-generated data is just too big to be manageable. It will become another enormous "organism" which takes on a life of its own, independent of its initial mission.

As a county elected official and a very active member of the National Association of Counties I have another concern. This agency could be misused to become yet another way to control local activities from a distant "headquarters". Perhaps I am hypersensitive because of the nearly 3,000 miles separating

U.S. Department of Interior

-2-

August 09, 1989

me from Washington D.C. plus the expense and consequent relative infrequency of my visits there. But, I do have to recognize that responsiveness and understanding are inversely proportional to the square of the distance between the action in the field and the headquarters' remote control center.

For the above reasons and despite some general feeling that cooperation and mutual help is useful and appropriate, please register my opposition to yet another huge and costly federal bureaucracy. In the end it will exercise its "initiatives" to control and direct local governments to do its bidding. That is neither desirable nor an effective use of resources.

Thank you for the opportunity to comment. Please accept my compliments for your courage and open-mindedness in providing that opportunity to us.

Sincerely,

*Brad Jacobs*  
Bradley L. Jacobs  
Orange County Assessor

BLJ:lt

cc: John P. Thomas  
Executive Director  
MACO

William J. Canary



MEMORIAL UNIVERSITY OF NEWFOUNDLAND  
St. John's, Newfoundland, Canada A1B 3Y1

Queen Elizabeth II Library

Map Library

15 August 1989

Pat Korp  
U.S. Department of the Interior  
Bureau of Land Management (B40)  
18th & C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C.  
U.S.A. 20240

Dear Mr./Ms. Korp:

I am hopeful that my comments will reach you in time. Generally, I found the "initial draft" of the "Land Information Study" to be clear and well written. The executive summary did a particularly good job of making the main points and summarizing on the issue. The full report was comprehensive and well organized. I hope that it will be listened to, and that the suggestions regarding funding do not result in it being tossed into the wastebasket, so to speak.

There are some stylistic suggestions which I shall pass along in a positive spirit. If possible before final printing, look through the document for spacing inconsistencies. There are spots where words are run together and some paragraphs have blank lines between them while others don't. I found the squashed together appearance distracting, perhaps, justifying the columns would help. I attach a list of specific things which I noted during my reading, as well.

Sincerely,

*Alberta Auringer Wood*

Alberta Auringer Wood  
Map Librarian and  
Past President, American  
Congress on Surveying &  
Mapping

AAW/eb  
Encl.

ENVOY: QEILIB  
Tel.: (709)

737-8892

DEPARTMENT OF GEOGRAPHIC INFORMATION

Summap Centre, Main and Vulture Street, Woolloongabba.



When replying please  
quote this number:  
Contact: 89 63210 Aust.  
Telephone:  
Your reference:



Reply to: Surveyor-General  
P.O. Box 40 Woolloongabba  
Queensland Australia 4102  
Telex: Survaj AA 40208  
Fax: NAT (07) 896 3276 (General)  
INT (817) 896 3276  
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9 August 1989

Mr. J. Moeller  
Acting Assistant Director  
Support Services  
United States Department of the Interior  
Bureau of Land Management  
18TH & C. STREETS N.W.  
ROOM 5622  
WASHINGTON D.C. 20240

Dear Mr. Moeller

I have received a copy of the Study of Land Information Systems, Draft Executive Summary, and am pleased to offer the following comments:

The Study undertaken by the Department of Interior is similar in intent and style to many in Australia and, indeed, around the world.

It also occurs to me that the concerns expressed in the Draft Executive Summary are matters that my Department has addressed during the last decade and I feel that it may be beneficial to share some of my experiences with you.

I am convinced that the key to success in systems-design lies in the adoption of a strategic planning approach. Only in this way can objectives be clarified and maintained, in relation to user-requirements.

It is also important to have this planning carried out on the appropriate plane, one which recognises that land information systems underpin land management practices, which in turn, determine to a large extent, the standard of living and quality of life of the community.

I have been fortunate enough to have developed my appreciation of these factors in a global context, including several visits to the United States, Canada and United Kingdom. I also have first-hand knowledge of developments in south-east Asia.

Should you feel that I could make a meaningful contribution to your deliberations, I am confident that my Government would facilitate my attendance at any subsequent enquiry you may instigate.

Yours faithfully,

*Kevin J. Davies*

KEVIN J. DAVIES  
SURVEYOR-GENERAL

University of California  
Santa Barbara, California 93106  
805-961-8224

State University of New York  
Buffalo, New York 14260  
716-636-2545

University of Maine  
Orono, Maine 04469  
207-581-7149

August 10, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

ATTN: Pat Korp

Dear Mr. Moeller,


I have read the draft report "A Study of Land Information" with great interest. I hope the report furthers the development of LIS within the Federal government for the land exchange program as well as many other uses.

Given my current research interests, I looked more closely at the section entitled "Benefit/Cost Analysis." I am very pleased that you, or whoever compiled this section, saw fit to use material from the recent article in the International Journal of Geographic Information Systems by Holly Dickinson and myself. I did notice, however, one editing error which substantially alters the meaning of the section where it occurs. On page 49, right hand column, within the first paragraph under the sub-heading "What is a Benefit/Cost analysis," item # 2 reads "production of original products, . ." This item should read "production of more of the original products . ." to differentiate the second item from the first.

I also noted some inconsistency in citations, etc. I assume this is simply a reflection of the draft status and the final version will cite the source for the material comprising the subsection "What is a Benefit/Cost analysis?" It has been predominately taken from the enclosed article, pages 313 - 317. Also, citations to other authors that were in the original article have been dropped in the draft version. These probably should be included in the final version of the report.

Once again, Holly and I are pleased you feel this material is relevant to the LIS activities within BLM and I trust we will be able to exchange ideas and experiences on the economics of LIS within the future research activities of the NCGIA.

Yours truly,



Hugh W. Calkins  
Research Associate, NCGIA and  
Associate Professor, Department of  
Geography

HWC:k1b



STATE OF FLORIDA  
**INFORMATION RESOURCE COMMISSION**

Office of the Executive Administrator  
Executive Office of the Governor  
The Capitol  
Tallahassee, Florida 32399-0001  
(904) 498-4194

BOB MARTINEZ  
Governor  
JIM SMITH  
Secretary of State  
BOB BUTTERWORTH  
Attorney General  
GERALD LEWIS  
State Comptroller  
TOM GALLAGHER  
State Treasurer  
DOYLE CONNER  
Commissioner of Agriculture  
BETTY CASTOR  
Commissioner of Education

Mr. John Moeller  
U.S. Department of Interior  
August 18, 1989  
Page Two

local governments regardless of whether the Land Information Commission is the final means of accomplishing these tasks. The State of Florida has had success with strategic planning, having completed several projects, and I suggest that a multi-agency strategic planning effort be initiated at the federal level with concentration on land information. It was through strategic planning that we realized the importance of geographical information systems to state government.

The Study is a good foundation for a coordinated effort between federal, state, and local organizations, and I look forward to reviewing the final version.

Sincerely,

  
Mike Hale  
Executive Administrator

MH/SPC/mlh:05290

Enclosures

August 18, 1989

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
U.S. Department of Interior  
Bureau of Land Management  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

Thank you for the opportunity to review the draft report A Study of Land Information. In Florida, we are faced with similar problems and issues in managing land information.

The State of Florida has begun addressing these same issues through the Growth Management Data Network Coordinating Council, a cooperative activity of state agencies with land information needs and responsibilities. I am enclosing the Strategic Directions Report from a strategic planning project sponsored by the Information Resource Commission and the Coordinating Council, and a draft copy of the Growth Management Data Network Coordinating Council Interagency Agreement developed by the Coordinating Council.

The need for coordination of land information activities between agencies and levels of government is especially important today with the increasing need for information and the high cost of collecting and managing information.

To implement the recommendations of the Study, many details will need to be determined, such as: Who appoints state and local coordinators? How will the network of land information systems be implemented? What standards will be adopted? What means of enforcement will there be for standards?

While supporting the National Land Information Commission concept, I would like to see emphasis at the federal level on cooperation, standards, data sharing, and providing technical assistance to state and



United States Department of the Interior

BUREAU OF MINES  
2401 E STREET, NW,  
WASHINGTON, D.C. 20241

August 21, 1989

Memorandum

To: Pat Korp  
Bureau of Land Management

From: Barbara White, Division of Policy Analysis  
Bureau of Mines, Washington, D.C.

Subject: Review and Comment on the Initial draft of the Land Information Study mandated by Public Law 100-409

We have reviewed the subject report and believe that it meets the requirements of Public Law 100-409. We agree that with the increasing number of land information system (LIS) efforts at the federal, state, and local levels a coordinating mechanism is needed. We also believe that a commission formed for the purpose of providing oversight and leadership for LIS activities at all levels of government is a good way to facilitate this coordination. We think it is important to further explore the option of a single Federal mapping and surveying agency. A single agency may increase the efficiency and reduce the costs and the time required to implement the LIS concept at the Federal level. This should be a high priority task for the commission.

One part of the report which we feel could be strengthened is the chapter on Benefit/Cost Analysis. We recognize that a quantitative estimate of the benefits is beyond the state-of-the-arts at the present time. However, a more focused qualitative identification and discussion of the perceived benefits would significantly add to the information included in this chapter.

Thank you for the opportunity to review the draft report.

*Barbara White for*  
Barbara White

AUSTRALIAN  
LAND INFORMATION  
COUNCIL



Secretariat: Address Floor 2 Belconnen Chambers Cnr Edmonstone Place and Cameron Avenue Belconnen ACT  
Postal Address PO Box 2 Belconnen ACT 2616 Telephone (062) 52 6984 Telex AA 62183 Facsimile (062) 51 6735

*my reference 88785*

Acting Assistant Director, Support Services  
US Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240

4 August 1989

Dear Mr Moeller

I refer to your invitation to comment on the Initial Draft of the Executive Summary of the Land Information Study.

Although it is a little to too late, and perhaps also inappropriate for the Australian Land Information Council to comment, your Executive Summary is particularly interesting as it is evident your Bureau is addressing many of the national coordination, standards and education issues which the Australian Council has under review.

I am enclosing two publications which may be of interest to the Bureau of Land Management and which give further details on how Australia is considering LIS issues from a national perspective.

The Council would also be particularly interested in a copy your report.

Yours sincerely

*W. E. Daw*  
(W E Daw)  
for Secretary  
Australian Land Information Council

STATE OF NEBRASKA  
NATURAL RESOURCES COMMISSION

KAY A. ORR  
GOVERNOR

DAYLE WILLIAMSON  
DIRECTOR

August 16, 1989

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th and C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear John:

I reviewed your letter and Draft Executive Summary of A Study of Land Information Systems. The only item that I can add to your thorough approach would be to suggest some type of database accessible to state, federal and local computer access.

Sincerely,



Terrence L. Kubicek  
Deputy Director/Chief, Planning Division

TLK:lb



Pierce County  
Department of Permits and Land Services

2401 South 75th Street  
Tacoma, Washington 98409  
Tel 206 591-7200  
FAX 206 591-3680

DEBORA A. HYDE  
Director

August 15, 1989

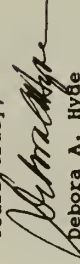
Mr. John Moeller, Acting Assistant Director  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th and "C" Street NW  
Main Interior Building, Room 5622  
Washington, D.C. 20240

Dear Mr. Mueller:

Joe Scorcio, the Director of Pierce County's Planning and Natural Resource Management Department, provided me with a copy of your "Draft-Executive Summary on the Study of Land Information Systems," for my review.

As the Chair of Pierce County's G.I.S. Task Force, I was pleased to see your agencies' interest in providing a cohesive, coordinated land information system. I would appreciate being placed on your mailing list so that I can receive any future information you or your agency generated on the subject.

Yours, truly,



Debora A. Hyde  
Director

DAH/jkr  
WP:a:dm

cc: file



**Section of Real Property,  
Probate and Trust Law**  
750 North Lake Shore Drive  
Chicago, Illinois 60611  
ABA/net: ABAZ15  
(312) 988-5550

**AMERICAN BAR ASSOCIATION**

**Reply To: 501 Sovran Bank Building  
Harrisonburg, VA 22801  
703-434-3455**

**August 18, 1989**

**John Moeller  
Acting Assistant Director, Support Services  
U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C Street, N.W.  
Main Interior Building - Room 5622  
Washington, DC 20240**

**Re: A Study of Land Information,  
Draft Report**

**Dear Mr. Moeller:**

David Allen Richards, Chairman of the Real Property Division of the Real Property, Trust and Probate Section of the American Bar Association, has asked me to respond to your request for review of the above referenced report. I am responding as Chairman of the Committee on Improvement of Land Records of that Section. This response does not represent a sanctioned response or position of the ABA or the Section. I have limited this response to the portions concerned with land records.

I suggest correcting the second paragraph of the text in the box on page 29. The basic problem with this paragraph is that the pronoun "it" in line three has the wrong antecedent. The words "the cadastre" could be substituted for "it" to improve the sentence, but I suggest it be reworded as follows:

*Thus, while the local depository for title records should be the source of the cadastre in a land information system, the cadastre is more often a product of dubious accuracy from a combination of sources, such as aerial photographs, unreferenced deed descriptions, and existing, manually maintained assessors' maps.*

The part on Land Transfer and Abstracting on page 34 also needs correction. The first is in the first line and is merely grammatical. I have put a period after the title of the section, removed the dashes, and capitalized "At".

In the third line of the first paragraph, the word "must" should be changed to "cannot". This produces the right meaning and makes it consistent with the first paragraph in the boxed text on page 29.

The last sentence of the first paragraph is the same as the second paragraph in the boxed text on page 29, and should be changed as I have already suggested.

The sentences corrected now read as follows:

*Land Transfer and Abstracting. At present, publicly available land records relating to ownership, description, and valuation of real property cannot be depended upon as the source of information for cadastral definition.....Thus, while the local depository for title records should be the source of real property rights in a land information system, the cadastre is more often a product of dubious accuracy from a combination of sources, such as aerial photographs, unreferenced deed descriptions, and existing, manually maintained assessors' maps.*

Thank you for this opportunity of review. If there are questions, please call.

Sincerely,

**Bishop Dansby  
Chairman, Committee on  
Improvement of Land Records,  
Real Property, Trust, and  
Probate Section,  
ABA**

**BD/cm**

**cc: David Allen Richards  
Harlan Onsrud  
John Behrens**

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BOARD OF COUNTY COMMISSIONERS

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County Administrator

James G. Yeager  
County Attorney

August 7, 1989

Mr. John P. Thomas  
Executive Director  
National Association of Counties  
440 First St. NW  
Washington, DC 20001

Dear John,

In reply to your letter of July 26, Lee County purchased an Intergraph Interactive Graphics and Data Management System in November, 1984, and has purchased additional hardware and software in FY 1987/88. The Land Information Systems Division has digitized base map information and zoning information overlays covering all of Lee County into the System. The Property Appraiser's Office simultaneously digitized property ownership lines, parcel numbers, dimensions, and related information into the System. Additional in-house programming, procedures and techniques for data entry, positional control, editing and quality control, were all developed to assure that the program's objectives would be met. The map information listed above is now in the system, automated mapping is now operational.

The objectives of our automated interactive graphics and data management system are: (1) to provide the capability for all elements of Lee County Government to rapidly obtain maps at any scale, covering any desired area, and very selectively portraying those map elements needed for a specific project. (2) to provide useful and understandable maps to the citizens of Lee County especially relating to governmental services and regulations (e.g. property, zoning and transportation maps). (3) to eliminate duplication of mapping projects in county government, and (4) to provide a data base of attribute information linked to map elements to produce displays and reports for management, planning, construction, and assisting in providing services to all the populace of Lee County.

Problems with exchange of information between Agencies, Counties and Local Government

Many Federal and State Agencies have relied upon the geographical coordinates by degree, minute and second (longitude, latitude).

This has been advantageous to the USGS Department and other agencies. While this has provided them with the accuracy they require, it leaves local government with a lack of geographical locations because we are relying on the S.P.C. (State Plane Coordinates).

We would like to see this information translated into Northings (Y) and Eastings (X) for accurate placement into LIS/GIS Systems.

Mechanisms and/or processes to be established to improve the Nations' Land Information Systems to assist the Federal Government in developing policy for such recommendations.

There is an urgent need for forming a panel at the Federal level composed of representatives of all states dealing with:

- 1) "A Digital Public Land Data Base"
- 2) "Standards, Rules and Regulations for Lis/GIS Systems"
- 3) "Standards, Rules and Regulations for implementation of the standards for photogrammetry into Lis/GIS Systems"

The State panels should be composed of LIS/GIS users at all levels of Government to address areas such as: Map Standards, Symbolization, Source Materials, Specifications for Aerial Imagery, Contour Mapping and the creation of survey controlled networks.

Establish land records legal descriptions based on SPC. (By X & Y). This data in digital format could then be shared by all agencies regardless of the Lis/GIS software through the use of land data file translators.

Sincerely,  
LEE COUNTY, FLORIDA  
BOARD OF COUNTY COMMISSIONERS

Ed Pike, Director  
MANAGEMENT INFORMATION  
SERVICES

cc: Frank Nocera  
Terry Dillon



Management Association  
for Private  
Photogrammetric Surveyors

August 18, 1989

Ms. Pat Korp  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, NW  
Room 5622  
Washington, DC 20240

Dear Ms. Korp:

Thank you for providing us a copy of the initial draft of the Land Information Study pursuant to section 8 of PL100-409.

The Management Association for Private Photogrammetric Surveyors (MAPPS) is the only national association whose membership is exclusively comprised of private firms in the surveying, mapping and land information business. MAPPS actively supported the enactment of this law and in fact, was specifically named in Congressional debate on the floor of the House and Senate as the private sector group to be consulted during the study. Among those who mentioned MAPPS in the debate on this bill was Sen. Breaux of Louisiana and then-Rep. Lujan of New Mexico (now the Secretary of the Interior), the author of section 8.

As you may recall, MAPPS asked that it have a representative on the study team. Our request was denied. Instead, our only opportunity to provide input was through an ad hoc committee of representatives of a variety of interests. This committee included individuals from county government, State government, the Tennessee Valley Authority, a State supported university, retired Defense Mapping Agency, retired U.S. Geological Survey, Census Bureau, hardware and software vendors, and other sectors. Individuals from private surveying and mapping firms were in a distinct minority on the committee.

While we found the committee very knowledgeable and dedicated to the advancement of land information systems, the group had a perspective that was not representative of the interests of the private sector and our views were diffused through this labyrinth of interests. Some of our recommendations were not endorsed by the ad hoc committee, while others were rejected by the core team. Indeed, we found, that the ad hoc committee tended to duplicate the interests of those on the BLM's "core team" (Federal, State and County Government and academic instruction).

BLM  
Page 2

As a result, we believe the study fails to recognize the reality of private practice in surveying, mapping and land information, is confused about the capabilities of private firms and is flawed in its discussion of the role these firms are playing today and should play in the future development of land information systems.

Not only was MAPPS, nor any other member of the private sector, afforded the opportunity to sit on the study team, but never during the one-year study did BLM issue a request for comments, a Federal Register notice announcing the existence of the study or meetings of the core team, nor were there public hearings or any other effort to reach out and hear the views of the general public or the private sector.

Consequently, the initial draft reads like a government report. While we support many sections and believe they are well developed, we regret that it does not have the balance, objectivity and insight that would have been present had the private sector been an integral part.

Because this is our only opportunity to provide direct input, we urge that the final report adopt the recommendations outlined in these comments.

Moreover, we respectfully request that these comments be printed in their entirety in the final report. Inasmuch as MAPPS in particular and the private sector generally were denied the opportunity to participate directly in the study, despite the law's requirement to do so, we believe you accommodating this request is the least BLM can and should do.

We hope your final report will be one that we can support and one which we can work with BLM to implement. We believe the changes suggested herein will strengthen the report and make it one private surveying and mapping firms can endorse.

Sincerely,

Rodger D. Phelps, PLS  
President

The following are detailed comments on the 7/27/89 draft. Some are discussion of the current text, others suggest additions or revisions, New text is underlined. Page references correspond to pages in the draft.

page 2

#### Land Information Management

Many terms are used to describe the process and technology that are the subjects of this report. These include Automated Mapping/Facilities Management (AM/FM), Geographic Information Systems (GIS), and Multipurpose Cadastre (MPC).

The future LIS will be a sophisticated computerized system that is integrated to manage a variety of data that are geographically referenced or tied to points on the land that can be analyzed in many different ways. The basic requirement is to have geodetic, cadastral, and cartographic data bases linking both graphic and non-graphic, qualitative and quantitative administrative, legal and parcel data.

#### Previous studies

Previous studies by the National Research Council ... resource management, infrastructure management, and environmental planning.

page 3

#### Coordination and Roles/Responsibilities

Local governments ... rely on land information bases for many needs, not the least of which is for property taxation.

There are two segments of the private sector which have a role in an LIS.

Many private organizations are significant users of LIS data. These firms, which take basic LIS data and provide added values or analysis in order to sell enhanced data to clients, should be assessed fees that can significantly underwrite to cost of building and maintaining LIS data bases.

There is also within the United States a qualified, capable and extensive private sector surveying and mapping industry. These firms can make a valuable contribution in the development of an LIS data base, as well as in the maintenance of the parcel maps and data and the development of new hardware and software to support LIS activities. The services of these firms should be used in lieu of a build up of in-house capabilities by government agencies at all levels which are involved in LIS data collection or data management.

page 5

#### Recommendations

We believe this section should be completely rewritten. As it appears in the draft, it does not include specific recommendations. Specific recommendations should be clearly spelled out.

#### Land Information System Concept.

These systems should be structured on the same common components, use already existing data sources when they are current and accurate, and be linked through a geodetic coordinate system and accurate, large scale mapping. The components that all land information systems should contain are:

\* \* \*  
\* \* \*

\*Basic, accurate and current large scale maps that include topographic and planimetric features.

#### Coordination

We strongly oppose the creation of a National LIS Commission. Such an entity would be costly, duplicate existing activities and responsibilities, and be ineffective in achieving its goals. Moreover, nothing in the report indicates why the creation of a single Federal agency, which had been recommended by every major previous study of surveying, mapping and land information, was abandoned in favor of the Commission.

Many of the duties which would be assigned to the Commission-- develop model legislation, develop standards and examine models were among the tasks assigned to the Department of the Interior in Section 8 of PL100-409. To assign these tasks to a Commission is nothing short of passing the buck.

#### Funding

This section falls short of actually recommending a funding mechanism. As we will discuss later, we suggested a specific plan which was accepted by the ad hoc committee. There is no discussion in the report as to why this system was not included as a recommendation in the report.

This section should contain a discussion of the chaos that currently exists in the federal government. There are more than 39 Federal agencies involved in land information and there is no comprehensive effort to coordinate effort, prevent duplication or enhance the effectiveness of data collection, management and dissemination. Moreover, the Federal government itself owns and manages millions of acres of land. Even on the federal lands, there is significant room for improvement of land information management.

Page 10

We commend the study team for its emphasis on three critical elements of a land information system -- geodetic control, base mapping, and cadastral or boundary information. The recognition of these components as crucial to a successful system is perhaps the most significant and meritorious aspect of the study.

The section discussing these layers can be improved as follows:

geodetic control - x-coordinate and y-coordinate (latitude and longitude).

The second type of important layer is the large scale base map. Once geodetic control has been established, the major land features can be easily identified through current aerial photography are displayed on large scale map layer both in a digital or computer format or on traditional paper maps which can be generated from a computer data base. The most common cartographic elements are topographic features (contours, elevations, rivers, mountains, etc.) and planimetric features (roads, utility lines, buildings, etc.). When kept current and accurate, the base map layer makes it much easier to locate visually all other information in the system.

Page 13

#### Data Conversion

We urge, in the strongest possible terms, that this section be stricken. The use, or to be more precise, the "misuse" of data conversion to build land information systems is a practice that will come back to haunt government at all levels for many years to come. We all have heard the old adage about computers-- "garbage in, garbage out". That is exactly what many LIS agencies are doing today. They are scanning or digitizing old, inaccurate and out of date data. This is analogous to building a skyscraper on quicksand. It may look good now, but the shortsightedness will soon be realized, and the cost and damage will be tremendous.

This report is intended to provide Congress and those entities interested in advancing land information systems with a guide to the most effective use of this emerging technology. An ineffective, inaccurate and unreliable activity has no place in this report. Indeed, the report should carry a strong warning against the use of scanning and digitizing and data conversion. Instead, the study should impress upon readers the need for good, current, accurate data.

#### Barriers to a Coordinated Network

Again, the study team ducked the issue. The team, dominated by Federal employees, was apparently afraid to offend its superiors or call to Congress' attention the terrible waste and abuse of tax dollars in the current uncoordinated, and duplicative Federal system.

The single most significant barrier to a coordinated network is a fragmented and uncoordinated Federal system. Areas are often mapped several times in a single year by numerous Federal agencies (not to mention mapping done by State, local and private sector entities), for single purposes and at different scales. This duplication and waste occurs because there is not single Federal entity to coordinate activities, provide guidance to State and local government, and be a clearinghouse for access to existing data.

The review of previous studies was selective and biased. Significant findings and recommendations which, if considered, would have radically altered the report's final conclusions. This is particularly true in such areas as creation of a single agency, funding, and utilization of the private sector.

On page 18, we suggest the following addition:

OMB Circular A-76, Reliance on the Private Sector for Commercial Activities (1955) established policy that

"the Federal Government will not start or carry on any commercial activity to provide a service or product for its own use if such product or service can be procured from private enterprise through ordinary business channels."

In the 1973 OMB Report of the Federal Mapping Task Force on Mapping, Charting, Geodesy and Surveying, it was reported that

"private cartographic contract capability is not being used sufficiently. We found this capacity to be broad and varied and capable of rendering skilled support..." Contract capability is a viable management alternative ... Its use should be encouraged in lieu of continued in-house build-up."

In its 1990 budget, the administration said,

"Privatization is an important management tool to raise productivity, cut costs and improve the quality of Government services ... (it increases) efficiency, quality and innovation in the delivery of goods and services ... specific areas where the Government could place greater reliance on private sector providers include ... map-making activities."

## Status of Implementation of Recommendations in Previous Studies

### Federal

The recommendation on contracting-out has been ignored by Federal officials. Scarce and valuable resources have been squandered through the build up of in-house staff and equipment, rather than contracting these requirements to the private sector. Federal contracting for mapping and related services has risen just 3 percent since the 1973 OMB report, while total Federal spending on such activities has grown by some 300 percent!

This build-up has multiplied and exacerbated the duplication, proliferation and lack of coordination of Federal surveying, mapping and land information activities.

### County

There are two projects in Louisiana which are extensively implementing the NRC recommendations. Funding for these projects is appropriated by Congress in the annual Commerce Department appropriations bill. The Commerce Department's National Geodetic Survey (NGS), a division of the National Oceanic and Atmospheric Administration (NOAA).

These projects, located in Jefferson and Calcasieu Parishes, are funded through Federal grants that are matched by the local governments, in accordance with the NRC reports. Each parish has assigned an office to coordinate and lead its LIS activities. A private contractor has been retained to provide a broad spectrum of consulting and data collection services. A detailed set of standards and specifications, in addition to using existing specifications (such as FGCC standards), have been and are being developed for mapping, parcel identification, control, computer acquisition and other critical areas. These pilot projects should be examined by all Federal and State agencies and serve as a model on development of land information systems in accordance with the NRC outline.

### Professional/Technical/Trade Associations

add the Management Association for Private Photogrammetric Surveyors (MAPPS) to the list of organizations active in LIS. MAPPS sponsors seminars on LIS, provides government agencies with a directory of firms capabilities, and recently published a "Standard Contract for Professional Services Between Photogrammetrist and Client" which serves as a balanced and comprehensive guide for retaining firms for a variety of LIS related services, including mapping, geodetic control, and data base development.

8. "private cartographic contract capability is not being used sufficiently. We found this capacity to be broad and varied and capable of rendering skilled support..." Contract capability is a viable management alternative... Its use should be encouraged in lieu of continued in-house build-up."

Summary

Although the National Research Council studies have provided guidance for developing LIS capabilities in some local governments, they have had little effect on the development of a nationwide network of consistent and comprehensive LIS within local government. More attention should be paid by Congress, Federal agencies and State and local government to the pilot projects in Jefferson and Calcasieu Parishes, Louisiana. These projects can serve as a model for implementation of many of the NRC's recommendations.

Need for an Appropriate Skill-Mix: Strike the last sentence and insert in lieu thereof the following:

Also of vital importance is the need to utilize the services of private sector firms in lieu of a buildup of personnel at the Federal, State and local levels of government. Such a system enhances technology transfer and encourages the exchange of information and knowledge between private practitioners and government employees.

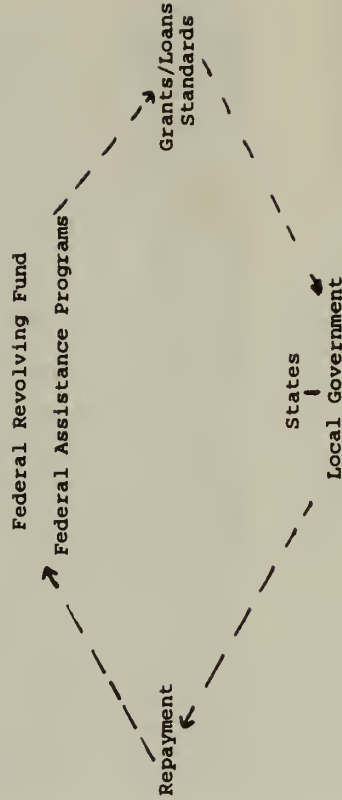
Need for a Focus for Funding: After the word "grants" add "loans" and at the end of this section add the following:

A system of Federal grants or loans, matched by a local share, should be developed, as recommended by the NRC. This financial assistance can be in the form of existing programs (e.g. Economic Development Administration Grants and others) and through the establishment of a Federal revolving fund that provides low interest loans to State and local government. In all instances, receipt of Federal funding for State or local LIS activities should be contingent upon adherence with Federal standards.

Recommendation: That appropriate existing Federal assistance programs be modified, either through legislation or regulation, to define LIS development as an eligible activity, thus qualifying such an activity by a State or local government recipient as suitable for these funds. Legislation should also be enacted to create a Federal revolving fund to provide low interest loans to local government for creation of LIS. In all cases, use of federal funds for LIS development by State or local government should be contingent upon adherence with established Federal LIS standards to ensure compatibility and proper expenditure of funds.

To start-up and sustain the revolving fund, an appropriate LIS related activity should be identified and legislation enacted to impose a user fee on the beneficiaries and data users of LIS.

LIS FUNDING FLOW CHART



The correct reference in the Commerce Department should be the National Oceanic and Atmospheric Administration. Under the Department of Agriculture, add Soil Conservation Service. Also add U.S. Army Corps of Engineers (Civil Works).

A table showing the 39 agencies, the number of employees involved in LIS related activities, and the annual LIS expenditure should be included in this section.

3. NOAA is also responsible for nautical and aeronautical charting. These activities contribute significantly to the LIS collection and dissemination activities of the Federal government. Moreover, NOAA has the legal responsibility, under the Land Remote Sensing Commercialization Act, to maintain an archive of LANDSAT data. This is currently carried out by the USGS at the EROS Data Center, under a memorandum of agreement. Legislation to transfer this authority from Commerce to Interior is currently pending in Congress. Finally, NOAA is carrying out LIS research through the funding and administration of Multipurpose Cadastre pilot projects in Louisiana and other locations.

Working through a grant and cooperative agreement from the National Geodetic Survey of NOAA, Jefferson and Calcasieu Parishes (Louisiana) are participating in pilot projects on implementation of the NRC studies. These projects have included all the major components outlined in the NRC reports, as well as the important elements highlighted in this report (See page 10). Using the Global Positioning System, satellite surveys have been conducted to densify the parishes' geodetic reference network and these points have been added to the national system. Accurate large scale base mapping is being provided from current aerial photography. Parcel maps showing boundaries are being developed. Land records are being verified and added to the data base. A lead agency has been designated in each parish, responsible for coordinating the needs of all participating agencies and users. These projects are receiving 60 percent Federal funding (provided by Congress in the annual Commerce Department Appropriations Act) and are matched by 40 percent local funding.

Minneapolis/Hennepin County, Minnesota - add the following: Hennepin County also developed a software system, known as UtiMAP, that has been commercialized. The county sold the rights to the software to a private venture which is now successfully marketing the system to local government and other LIS entities nationwide.

Private Industry and Organizations  
page 33-35

Private surveyors and photogrammetrists act as advocates for parcel based systems at the local level, since they are among the primary generators of LIS data. Surveyors understand the legal requirements of land information and their work must be capable of sustaining review and adjudication by a court of competent jurisdiction.

Private photogrammetry firms have for decades provided base maps for local government and, with the advent of computer technology, these firms now offer clients turnkey LIS services either through in-house capabilities or through associations with surveyors and other firms. These companies have been in the forefront of LIS data collection and development and have built a powerful capability and competence which support this new field.

There are more than 250 professional photogrammetric mapping firms in the United States. Most have, as a minimum, a digital mapping capability. Others can offer extensive LIS services from data collection to serving as consultants, service bureaus, managers of government owned/contractor operated facilities, as well as data collection and management contractors. Among these services are: aerial photography and digital satellite imagery, aerial photo processing; surveying (cadastral, geodetic, facilities inventory, engineering, hydrographic and others), analytical aerial triangulation; conventional photogrammetric mapping; orthophotography; digital mapping and digital data acquisition; digital terrain modeling; graphic and attribute data base compilation; data conversion; and data base development and management. Many of the leading firms have formed relationships with other organizations to provide financing for LIS development.

Government agencies at all levels of government should draw upon the capabilities of the private sector for data collection and data management services, in lieu of an in-house buildup of staff or equipment. To ensure high quality data, it is recommended that when government agencies contract with private surveying and mapping firms that such firms be selected through the qualifications based selection process such as that outlined for federal agencies in PL92-582 (as amended) and the American Bar Association Model Procurement Code for State and Local Government section of architecture, engineering and surveying services.

A large percentage of funds presently being spent in this country on LIS implementation involved data conversion. The term conversion refers to the transformation of analog data from paper or mylar maps into digital form, through processes sometimes called scanning or digitizing. Many LIS developers (particularly local government) mistakenly consider data conversion an appropriate and economical way to build a system. This process is virtually always more expensive than acquiring new data because the quality of existing data cannot be assured and the cost of checking and verifying such data is exorbitant. Efforts must be made to discourage this method of building data bases. The development of LIS standards is one way this seat of the pants activity will disappear.

International Activities  
page 36

The Management Association for Private Photogrammetric Surveyors (MAPPS), a national association of almost 100 private surveying and photogrammetric mapping firms, is currently forming an Export Trading Company to assist its member firms in an effort to sell these U.S. services in foreign countries.

Chapter VI  
Coordination  
Page 39

state functions, in cooperation with local entities

11. Award contracts for LIS data collection, development and management.  
important federal functions  
page 40

6. Encourage the development and transfer of technology and encourage growth in the private sector through the use of contracts with private firms for a broad spectrum of LIS activities in lieu of an in-house build-up.

There are two segments of the private sector which have a role in an LIS.

Many private organizations are significant users of LIS data. These firms, which take basic LIS data and provide added values or analysis in order to sell enhanced data to clients, should be assessed fees that can significantly underwrite to cost of building and maintaining LIS data bases.

There is also within the United States a qualified, capable and extensive private sector surveying and mapping industry. These firms can make a valuable contribution in the development of an LIS data base, as well as in the maintenance of the parcel maps and data and the development of new hardware and software to support LIS activities. The services of these firms should be used in lieu of a build up of in-house capabilities by government agencies at all levels which are involved in LIS data collection or data management.

Summary  
pages 40-41

Fifth, LIS activities at the Federal, State and local government levels should utilize the expertise and services provided by private firms. Contracting with private firms can yield significant savings in time and money compared to an in-house build-up. To assure the quality of data, the qualifications based selection method should be used to retain these professional service firms.

Chapter VII  
Guidelines/Standards  
pages 43-45

In general, this section, while a reasonable summary of ongoing activities and the need for more action, is woefully inadequate. The legislation creating the study called for the creation of model standards. In this area, the study team failed to discharge its responsibilities.

Specifically, there are three current activities that should be mentioned in this section.

The National Geodetic Survey is developing a Multipurpose Cadastre Guidebook. While this publication has not been released, and we have not had an opportunity to review it, the study team should have access to the document and provide a discussion in this section of the report.

NGS has also worked with Jefferson and Calcasieu Parishes, Louisiana on a number of documents that could serve as a valuable guide or model for other units of local government. This includes a Federal-local cooperative agreement, mapping and control specifications, parcel specifications, and computer acquisition specifications.

The Management Association for Private Photogrammetric Surveyors (MAPPS) has published a "Standard Contract Between Client and Photogrammetrist for Professional Services." This contract is a balanced and comprehensive guide to the retention of private firms for mapping, control, surveying and related data collection and data base development services.



Again, the study team has failed to accomplish the task assigned by Congress. While the current chapter provides interesting discussion of the costs and benefits of LIS, it fails to actually provide a cost/benefit estimate that Congress requested.

Another document the study team should have considered is a report conducted for NGS on the costs and benefits of geodetic control.

Chapter IX  
Recommendations  
pages 53-56

As currently written, this chapter is more a summary than a list of recommendations. It should be re-written in a more direct format.

The National Mapping Program and National Digital Cartographic Data Base managed by the USGS are at too small a scale to be used effectively for a LIS. This data is in appropriate for LIS and should not be referenced in this study. Rather, as the NRC suggested, base mapping for a LIS must be at a large scale. The private sector, not USGS, is most experienced, qualified and capable to provide this mapping.

#### Land Information System Concept

While we agree with what the study team seems to be suggesting, we believe more direct language would be appropriate. We suggest the following:

It is recommended that Congress pass legislation to establish a national policy to create integrated land information management systems at all levels of government and in the private sector.

#### Standards

Given the study team's failure to accomplish its task of developing model standards, this section is particularly weak. We suggest the following:

A single federal agency should be assigned the task of promulgating model standards that will foster the development of a network of locally based land information systems that provide for maximum data exchangeability among the various components of the network, and among all participants at the Federal, State and local government levels. Adherence with such standards should be required for all land information systems utilizing federal funds.

#### Coordination.

We strongly oppose the National LIS Commission. Nothing in the report provides a rationale for the Commission or its advantages over the creation of a single agency, which had been recommended by OMB and in several NRC reports.

A Commission will not have the political power to go to Congress for the authority it needs to secure required authorizations or appropriations. Moreover, the Commission will be powerless in the needed effort to coordinate the proliferating activities of LIS data collection and data utilization agencies. The Commission, on top of 39 Federal agencies currently involved in some aspect of LIS, is a "belt and suspenders" approach. In these times of reduced Federal spending and Gramm-Rudman limits, a single agency that will save tax dollars by eliminating duplication makes far more sense than a Commission which by its very nature is duplicative of existing Federal activities.

Finally, we strongly oppose a Commission that will be dominated by Federal agencies, with only token representation for the private sector. Indeed, as currently recommended, the Commission would not be required to have representatives of the single most important participant in LIS -- private mapping firms. Rather, the report suggests representatives of "private groups such as utilities or professional associations." BLM refused to permit private mapping firms to be represented on the study team and it comes as no surprise they would propose that such firms be excluded from the Commission.

We would suggest a single agency which consolidates the surveying, mapping and land information activities of all existing civilian agencies. In order to provide private sector input, there should be established a Federal Land Information Advisory Committee with members appointed by the President from the private surveying and mapping community.

This system would be less costly than a Commission, result in real coordination and provide meaningful input from the private sector.

#### Funding.

As we previously suggested, a system that utilizes existing Federal assistance programs and a new LIS revolving fund should be recommended. Additionally, a user fee should be recommended to provide a steady source of start-up and operational funds for national LIS effort based at the local level. Use of these funds should be contingent upon compliance with Federal standards.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Center for Health Statistics  
Centers for Disease Control  
3700 East-West Highway  
Hyattsville, MD 20782

OMB Circular A-16 should be reviewed to

6. Assure compliance with OMB Circular A-76 in order to prevent costly, unnecessary and duplicative increases in Federal hiring and equipment acquisitions when contracting out is more appropriate and cost effective.

August 23, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
Main Interior Building - Room 5622  
18th and C Streets, NW  
Washington, DC 20240

Dear Dr. Hoeller:

I have reviewed the "Initial Draft" of the Land Information Study, mandated by Section 8 of Public Law 100-409, and offer the following editorial/stylistic comments:

1. The Fish and Wildlife Service informs me that the abbreviation of the word and "(s)" in their title should be spelled out (p.25, para.6, ln.5).
2. On the very next line (p.25, para.6, ln.6), the word "Burea" should be spelled "Bureau."
3. I believe the fraction "1/3" should be spelled out to "one-third," as it appears in the text (p.29, para.1, ln.6). A reference to "three-fourths" appears on page 9.
4. The use of "1/1" is really a fraction and not a ratio (p.50, para.5, ln.5). You could use "1:1" or "1 to 1." The latter format appears consistent with your similar entries on page 48 (para.3 and para.5).
5. I've grappled with the use of the term "an LIS" (see, for example, p.22, para.8 and para.10), and find it to be somewhat awkward. Perhaps "a LIS" or "a LIS mechanism" or "a LIS standard" would sound more comfortable. It appears throughout the report (pp.34, 38, 54), but it holds the least priority in terms of my observations

Sincerely,

Charles M. Croner, Ph.D.  
Statistical Technology Staff  
Office of Research and Methodology

cc: A. White

62 Rawson Woods Circle  
Cincinnati, Ohio 45220  
August 18, 1989

Mr. John Moeller  
Acting Assistant Director  
Support Services  
Bureau of Land Management  
U.S. Department of the Interior  
Washington, D.C. 20240

Dear Mr. Moeller:

I am writing to you in long hand because I have been confined to my home while I recover from major surgery followed by complications.

John Behrens called to urge me to attend the recent ILI meetings. I had to tell him that it would not be possible to do so. I suggested to him that there is a real need to explain to local and state officials concerned with land information how a Compatible, Multipurpose Land Information is created and how it will meet their needs more effectively and over the years at a lower cost. Presentations at professional meetings will not meet this need. I suggested to John that the Department of Geology at Ohio State University in conjunction with ILI and other concerned state organizations have a Work Shop or Conference in Ohio on a Compatible, Multipurpose Land Information System. The Work Shop or Conference should be primarily for public officials (state and local) and without private persons from Ohio and the adjoining States. Such a Work Shop or Conference

OK (Ohio State University)

would have in attendance persons from states whose land is not included in the public land surveys and other persons from states including Ohio, which have the public land surveys. I also suggested to John that the Bennett Foundation might be willing to provide most or all the financial support needed for the Work Shop or Conference. John thought that you might be interested in having such a Work Shop or Conference.

I had suggested to Bob Manly who is a local attorney and on the Board of ILI having the Work Shop or Conference in Columbus sponsored by the Department of Geology, Ohio State University, ILI, and other organizations. Perhaps the State of Ohio and the states which adjoin Ohio would create a special committee to assist in holding the Work Shop or Conference.

I read with special interest "A Study of Land Information" (Draft Report) because it sets forth in some detail and recommends the land information system of which I was the principal developer with substantial assistance from experts from concerned discipline. The system was first presented at the Tri-State Conference on a Comprehensive, Unified Land Data System (CULDATA) December 9 and 10, 1966 held at the College of Law University of Cincinnati.

At meetings of MOLDOS (now ILI) some persons said that "multipurpose" was more descriptive than "comprehensive". A member of the Board who worked for A+T, objected to "Unified"

because it required all systems to be identical. "Unified" was changed to "Compatible". It was stated that "information" was more descriptive than "Data". After all of these changes, we now refer to Compatible, Multi-purpose Land Information System.

On the inside of the front cover of the Proceedings of the Tri-State Conference on A Comprehensive, Unified Land Data System (CWLSDAS) appears this quotation from Woodrow Wilson

"Our duty is, to supply the best possible life to a federal organization, to systems within systems, to make town, city, county state and federal governments live with a like strength and an equally assured healthfulness, keeping each unquestionably its own master and yet making all interdependent and cooperative, combining independence with mutual helpfulness."

If you desire to include this quotation in "The Study" the reference division of the library of congress should be able to give you the source of the quotation.

I noticed in "The Study" reference to "unified" systems, "integrated" systems, and "compatible" systems. Since the references are to computer programs, the words used to describe the relationship of the different systems should be the words most acceptable to computer experts.

As I stated above, in the ILI this was objection to use of the word "unified" and "compatible" was acceptable. Looking to use of "integrated", "unified" and "compatible" will raise questions as to what is the difference. "Compatible" needs to be defined to avoid misunderstanding. At an ILI meeting one person said "compatible" meant within a county. I had to correct this person by referring to Metropolitan Cincinnati which includes part of Ohio and parts of Kentucky and Indiana. The Compatible Multipurpose Land Information System of each county in Ohio must be compatible with similar systems in the other counties of Ohio and with similar systems in the counties which air states which adjoin Ohio. Thus each local, state, and federal system must be compatible with all other local, state, and federal systems. Not only have land information systems kept by different agencies in the same county or city been incompatible, but information systems kept by different divisions of a federal department have been incompatible.

There has been a problem with respect to classification of things like soils, geological data, vegetation (crops, trees, etc.), land use, structures, etc. I don't believe it is rational to allow each county, each state, and each federal agency to develop its own unique classification system relying on computer to make these classifications compatible. There must be a central authority which develops these classifications and provides for subsequent modifications.

The study uses the words "multipurpose" and "comprehensive" I was criticised for using "comprehensive". "Multipurpose" was substituted for "comprehensive". "Multipurpose" is not entirely accurate because a system could be "multipurpose" by serving two needs when we intend that it should serve six needs to be comprehensive and multipurpose. "Multipurpose" should be defined to require that the system be "comprehensive".

I have noted on the enclosed copies of certain pages my suggested changes. I have also enclosed for ready reference some selected pages from the Proceedings of the Tri-State Conference on a Comprehensive, Unified Land Data System (CULDATA).

I expect to be fully recovered in a few months.

Best wishes

*Smalley,*  
 Bob Cook  
 Robert N Cook  
 Prof. Emeritus of Law  
 College of Law  
 University of Cincinnati.

United States  
 Department of  
 Agriculture

Forest  
 Service

Washington  
 Office  
 12th & Independence SW  
 P.O. Box 96090  
 Washington, DC 20090-6090

Reply to: 1390

Date: AUG 21 1980

Subject: LIS Study Draft Report  
 (Your 7/27 ltr.)

To: Mr. John Moeller  
 Acting Assistant Director, Support Services  
 U.S. Department of the Interior  
 Bureau of Land Management (840)  
 18th & C Streets, N.W.  
 Main Interior Building - Room 5622  
 Washington, D.C. 20240

Following are Forest Service comments on the draft report "A Study of Land Information."

The phrase Land Information System (LIS), as used in the report, encompasses many of the data layers normally associated with the broader idea of Geographic Information System (GIS). Are the terms synonymous to the Committee drafting the report? If so, this should be clearly stated in the Executive Summary and body of the report. If not, the distinctions between the two systems should be stated. This would better define the scope of activities that the proposed LIS Commission would be involved in.

As you are aware, the Federal Interagency Coordinating Committee on Digital Cartography (FIGCDC) is actively involved in many of the functions proposed for the LIS Commission. Many of the FIGCDC functions relate to coordinating data requirements for GIS activities. A rewrite of their charter is in progress. Expansion of current activities is being considered. The potential for duplication in some areas appears high. A reference to the proposed relationship between the FIGCDC and LIS Commission is needed to clarify the Committee's thinking on this point.

We support better coordination on land related information through standards which will allow and facilitate the exchange of information among government agencies and their cooperators. The formation of an additional agency or commission is not essential to the development and utilization of these standards nor the utility of the information. We are concerned that this duplication of programs will be promulgated without an improvement in information sharing.

Thank you for the opportunity to comment on the draft report.

*James E. Webb*  
 JAMES E. WEBB  
 Associate Deputy Chief



# Ferris State University

Construction Department

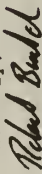
August 20, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
Attn: Pat Korp  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Pat Korp:

Attached are some comments on the initial draft of the Bureau of Land Management LIS study. Thank you for giving me the opportunity to review this document. I like it and hope that it will help spur others to initiate systems throughout the country.

Sincerely,



Robert Burtch  
Associate Professor  
Surveying & Mapping Program

The draft report of "A Study of Land Information", prepared in accordance with Public Law 100-409, very succinctly presents information that demonstrates that there is a real need for the development and implementation of land information systems within the U.S. Activities in this area continue to grow. Federal, State, and local governments all recognize that intelligent decision-making can only occur when the input data are correct, timely, and in a usable format.

Unfortunately, there are too many systems today that lack coordination which could even enhance the benefits of the system. The real benefits accrue when costly data duplication are reduced. This occurs when data sharing becomes prevalent. At the local level, single purpose systems may hinder LIS development because of county commissioner reluctance to put more money into a system that may not meet the goals identified in the beginning of the project. This study very clearly states that one of the most important roles of a LIS agency at the federal level will be to offer a central office which can promote system compatibility. This means that data that are collected at the local level can be aggregated and generalized for more regional and even national purposes. This aggregation of data can only occur if data are compatible.

This draft report outlines the importance of technology within a LIS. Indeed, computer advances have made the emergence of land information systems much more affordable and practical. Newer generations of computers will have even more impact. But, a LIS is not about computers but pertains to the efficient management of data. Indeed, an inefficient data system employed within the decision-making process will become bogged down even with the computer. The LIS needs to look at the organizational and institutional problems that inhibit efficiency. This report is saying this, especially in Chapter III, but this should be made more emphatic.

I hope that this study becomes a platform that will move us forward in the development of LIS in this country. What would be very beneficial now is a time table that outlines where we will be in the next five and ten years. We need to move forward as a nation.

123 Kingston Drive  
Slidell, Louisiana  
70458  
August 14, 1989

U.S. Department of Interior  
Bureau of Land Management (840)  
18th & C Street, NW  
Main Interior Building - Room 5622  
Washington, DC 20240

Gentlemen:

At the request of Mr. James P. Wiedener, President of the American Congress on Surveying and Mapping, I have reviewed the draft report, A Study of Land Information in Accordance with Public Law 100-409, U.S. Department of the Interior, July 27, 1989.

I am enclosing my comments and recommendations on the draft report in response to your letter of July 14, 1989.

Sincerely,



Morris R. Heinzen

COMMENTS ON THE "DRAFT REPORT" OF  
A STUDY OF LAND INFORMATION SYSTEMS

1. General comment on the content of the draft report - I read the draft report with great interest. The contents of this report will be used to provide future guidance to the government and private sectors in implementing a comprehensive Land Information System for the United States with appropriate standards.
2. General comment on the work of the report committee - The committee has completed a well written inclusive report.
3. General comment on geodetic, property marker and other land information accuracy - In chapter VII of the report, the accuracy of geodetic points are discussed in terms of First Order, Second Order Class I, etc., as established by the Federal Geodetic Control Committee (FGCC). Similarly the report refers to the National Map Accuracy for map scales less or equal to 1:24,000 and to standards established by American Society of Civil Engineers (ASCE) and American Society of Remote Sensing and Photogrammetry (ASRSP) for map scales larger than 24,000.
- I would like to recommend point data accuracy be represented in the LIS by variance/co-variance matrix relating the considered point to the survey's fixed control points and other points. Two co-variance matrices should be used, one for the absolute position and another for the relative position of the considered point to other control points.
4. General comment on LIS data origination - LIS data changes for land parcels should originate at the county or city/town registrar of deeds. LIS data changes for geodetic points other than property markers would originate from the National Geodetic Survey and be handled in a top - down manner. Safeguards must be built into the LIS to insure that unauthorized persons do not make changes to the LIS. A password authorization could be established to insure the users can obtain information but not change the data base, data can be keyed in by others but not reviewed by them, and other persons can have access to change records but not originate new records.
5. Comment on the Executive Summary - I have provided my comments on this summary which was previously furnished to me as the "Initial Draft".
6. Comment on Chapter I, Introduction - I have no comments or recommendations on this chapter.
7. Comment on Chapter II, Background -
  - a. On page 10 the reports states that the State Plane Coordinate system should be used to align the various levels of the LIS. I do not favor this system but recommend that the geographical position (GP) system of latitude and longitude be used instead. Since many users do not use either a GP or State Plane

system, a correlation between these systems and a land parcel system must be integrated in the LIS.

b. I agree that data conversion is the most significant issue and has the highest cost for the LIS.

8. Comments on Chapter IV, Issues identified in Previous Studies - No comments.


9. Comments on Chapter V, Ongoing Activities - I read this chapter with considerable curiosity and found it to be very interesting. No other comments on this chapter.

10. Comments on Chapter VI, Coordination - I agree with report's assessment of coordination requirements facing the LIS.

11. Comments on Chapter VII, Guidelines/Standards - I have no comments on the chapter.

12. Comments on Chapter VIII, Benefit/Cost Analysis - This chapter deals in generalities for the national LIS and is not an actual analysis of the projected benefits and costs.

13. Comments on Chapter IX, Recommendations - I concur with the recommendations contained within this chapter. I have no additional comments or recommendations to make on the final chapter of this report.

  
MORRIS R. HEINZEN



U.S. Department  
of Transportation  
Federal Highway  
Administration

AFG 22 (Rev)

400 Seventh St., S.W.  
Washington, D.C. 20590

IN REPLY REFER  
TO: HPN-22

Mr. John Moeller  
Acting Assistant Director, Support Services  
Department of the Interior  
Bureau of Land Management  
Washington, D.C. 20240

Dear Mr. Moeller:

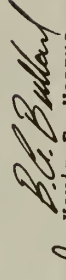
This is in reply to your July 14 and 27 letters requesting comments on the "Initial Drafts" of the Executive Summary and full report of the Land Information Study (LIS).

We support the recommendation of the study team that a focal point is needed to provide oversight for a comprehensive, consistent network and land information system across the Nation. The key to develop this network is a common goal on approach and standards.

The Federal Highway Administration interests are in two areas. The first is standard land record systems for the acquisition and disposition of rights-of-way for highways. The second area is the interrelationship between transportation and land use. Both of these areas would benefit greatly from a standard land record system.

We support your effort to improve the Nation's land information system. Additional comments, if any, will be provided at a later date. If you need any additional information please contact Mr. Roger Petzold at 366-4074.

Sincerely yours,

  
Kevin E. Heanue  
Director, Office of Planning





General Services Administration  
Public Buildings Service  
Washington, DC 20405



AUG 17 1989

Mr. John Moeller  
Acting Assistant Director,  
Support Services  
Department of Interior  
Bureau of Land Management  
Washington, DC 20240

Dear Mr. Moeller:

We have reviewed the "Initial Draft" of the Land Information Study, mandated by Section 8 of The Federal Land Exchange Facilitation Act of 1988, Public Law 100-409.

We would like to congratulate the Department of Interior for drafting such a fine report. Our agencies face the common task of managing real estate as a national asset, hence many of the issues identified in your report are applicable to the management of public buildings. We acknowledge the importance of having accurate information for effective asset management, for which reason we have developed a generic real property information system (FIRM) and are currently meeting with client agencies to develop a Federal regulation on asset management. Department of Interior is not only a user but also a strong proponent of FIRM.

Given the strong parallels between your efforts in improving the land information system and our program on asset management, it would be fruitful to have an informational meeting between our staffs. I will be calling you in the next few weeks to coordinate the meeting.

Sincerely

James M. Cayce  
Division Director  
Governmentwide Policy Division



**Land Information Systems**  
651 Pine Street, 8th. floor  
Martinez California 94553  
(415) 372-2386

August 7, 1989

United States Department of the Interior  
Bureau of Land Management  
Washington, D.C. 20240  
Attn: John Moeller, Acting Assistant Director, Support Services

Dear Mr. Moeller:

Contra Costa County has a Land Information System (LIS) serving both County Departments (Assessor, Public Works, Building Inspection, and Community Development) and outside agencies. The outside agencies are for the most part other local agencies - fire districts and cities. We also exchange data tapes with the State of California for the purposes of determining Home Owner's Property Tax exemptions and State Board of Equalization parcels. The federal government's Department of Commerce also receives reports from the system on Building Permits within the County.

A fundamental split exists between local governments and the state and federal levels as regards land information systems. The parcel is the fundamental key to most local government systems as the management of parcels is their primary function, while the state and federal governments seem to view land on a larger scale, with data based on physical location or census block.

Future integration of local, state and federal level data will probably come as Geographic Information Systems - those based on computerized maps come to the forefront. Currently, Contra Costa County is developing such a system, that will allow us to overlay a physical location base with parcel numbers and boundaries.

One major hurdle in developing GIS for local government is obtaining accurate aerial data and ground control. The federal and state governments could aid greatly in this process by establishing standards, and providing accurate and accessible satellite data. Aerial surveys are a great expense for a local government, and I'm sure that tremendous cost savings could be realized if federal satellite data could be utilized.

I would be interested in receiving a copy of your final report.

Sincerely,

Wm. Wickham Smith  
Land Information System Project  
Director

Contra Costa County

**M. NEIL FRANKLIN**

CIVIL ENGINEER  
PUBLIC SURVEYOR

P.O. BOX 1187 • BUDA, TEXAS 78610 • (512) 295-7601

August 22, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th and C Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240  
Attn: Pat Korp

Dear Ms. Korp:

Thank you for the opportunity to comment on "A Study of Land Information - Draft Report". I wholeheartedly support the philosophy behind this Land Information Study, and I compliment everyone involved in its concept and execution. Efficient and cost effective land management and exchange (whether these land be public or private) require a competent Land Information System network. Until now, these data have been assembled and maintained by numbers of individual jurisdictions, and stylistic differences--both quantitative and qualitative--have frequently hampered effective decision making. Currently, too many land records are maintained with the same mentality from which they originated, reminiscent of green eye-shades and quill pens.

However, the response to these circumstances should not be simply technological upgrading. Without the leadership, guidance, and coordination suggested by this Study, we could create a situation not unlike the last two decade's spasm of tax mapping. Too often, archaic records have been transferred to a modern format with little or no concern for the adequacy or accuracy of the information contained therein.

**M. NEIL FRANKLIN**

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There is little doubt that the guidelines and standards necessary to ensure compatibility and consistency will have to trickle down from the top. As the Study so aptly states, "Without Federal leadership, there will be little chance of compatibility among the land records of the individual States", and the same is true for the State/County relationship. Guidelines and standards should be developed and promulgated at the Federal level, customized as little possible at the State level, and put into practice at the County level. These guidelines should slant toward performance specifications, rather than technical specifications. Translatability between specified languages or specified formats is important, but specific software or hardware configurations are not. If the system should be interactive, say so, but don't spell out exactly how to make it interactive. The ultimate test of acceptability should be, "The user should be able to

Rather than attempting to convince local jurisdictions to fund LIS projects themselves and realize a tax savings, make grant money available to qualifying jurisdictions (counties?) and require them to identify their savings and return a portion to the grant fund. This might be difficult to monitor, but it certainly is a positive, upbeat approach. Programs could be done in steps (such as rural--and urban--addressing, geographic index, reconciliation of parcel anomalies, successive layering of graphic and non-graphic attributes, etc.), with separate grant applications for each stage, and no new application would be considered until the previous stage had been successfully completed. Grants should probably require some local fund matching, to ensure enthusiastic local participation and sustained interest.

In the event that an acceptable LIS network could be put in place nation-wide, two questions (at least) are raised which did not appear to be addressed by this Study:



MARY ANNE CUSACK  
CLEVELAND COUNTY ASSESSOR  
201 S. JONES, ROOM 150  
NORMAN, OKLAHOMA 73069

(405) 366-0730

M. NEIL FRANKLIN

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PUBLIC SURVEYOR

P.O. BOX 1167 • BUENA VISTA, TEXAS 78010 • (817) 298-7601

1. In the above-described Utopia, why would Federal or State agencies need to develop their own land information systems? They would certainly want to be able to assemble and manipulate information, but they would be users, rather than independent producers.
2. Also in our Utopia, who has access to this land information system? Is it public information, open to anyone, or should there be some "need-to-know" requirement? At some level, information necessary for a complete land information system might properly be labeled "confidential".

I am honored to have been selected to review this Land Information Study, and I hope my comments--fragmented as they are--may be helpful even in the slightest degree. Again, let me compliment everyone involved in the production of this excellent study.

Yours very truly,

  
M. Neil Franklin

August 22, 1989

John Moeller  
Acting Assistant Director  
Support Services  
Bureau of Land Management  
Washington, D.C. 20240

Dear Sir:

In accordance with your request, I have reviewed the "Draft Study" on land information. In my opinion, it is one of the most comprehensive documents that I have read.

The study presents in a very understandable format all of the various elements of land information and the present infrastructure to manage it. I was particularly pleased by the recommendations for intergovernmental participation in order to establish standards and procedures along with guidelines for construction and maintenance of the data, however, I believe that the work should be performed at the local level with a cooperative consortium of federal, state, and local governmental entities with assistance from the public utilities.

If I can be of further assistance, please don't hesitate to call.

Sincerely,



Mary Anne Cusack  
Cleveland County Assessor

MAC/cc

file

# Illinois State Geological Survey

**ENR**  
Illinois Department of  
Energy and Natural Resources

Natural Resources Building  
615 East Peabody Drive  
Champaign, IL 61820  
217/233-4747  
FAX 217/244-7004



LIS, p. 2  
August 22, 1989

**PROBLEM:** Need for an Appropriate Skill-Mix Section, page 22. Too much emphasis is placed on recruitment of university-educated (presumably recent graduates) for technical and administrative aspects of LIS. Insufficient mention (and presumably commitment) to additional education, in-service training, etc. of existing government personnel. The implication of this section is that technically competent personnel will only come from the universities leaving those who have worked for the government for many years to see their careers abruptly halted.

**RECOMMENDATION:** I urge you and those who prepared this document to consider stronger language in recommending in-service training and education for existing agency personnel. The following paragraph is submitted for your consideration.

**Need for an Appropriate Skill-Mix:**

The lack of personnel qualified to organize and manage technical and some administrative aspects of LIS has hampered its implementation. Recognizing that existing agency personnel are most familiar with their own data and its origins and use, they can best devise a program to implement LIS in their own agency. Governments and individual agencies must commit to the continuing education of existing agency personnel.

If you desire further explanation of the recommendations made here, please feel free to call on me at (217) 244-2186. Thank you for this opportunity to comment on a well drafted and thorough description of a complex issue.

Sincerely,

*Christopher Skohr*

Christopher Skohr, Associate Engineering Geologist,  
Topographic Mapping and Remote Sensing Coordinator

August 22, 1989

Pat Korp  
U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Streets, N. W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Dear Pat Korp:

Regarding the Draft Report of "A Study of Land Information" circulated by John Moeller, Acting Assistant Director, Support Services, U. S. Bureau of Land Management, I would like to offer the following observations and suggested changes.

**PROBLEM** There is little mention of public access to the LIS and purchase of the public-supported database. A LIS is a dynamic, ever changing database which will in spite of the best efforts, contain errors and omissions.

**RECOMMENDATION** Provision should be made for timely, direct and small-cost access to the LIS by the general public in order to verify accuracy of data, note and appeal incorrect data, and have reasonable assurance that corrections and disputed claims are recorded in the database. This should extend to sending updates to those who purchase and use the databases.

**PROBLEM** Some databases contain scientific, man-made classifications e.g. wetlands, soil, geology, etc. which are artificial and drawn with license. Property tax assessment, land use restrictions, etc. are made upon the basis of these classifications.

**RECOMMENDATION** Provision should be made for individuals to dispute scientific data without legal recourse, and for agencies to change information in the databases with notification of users of that database coverage. This could be stated specifically in the report as a recommendation that those providing data into a LIS have an obligation to substantiate data in the event of a dispute or request in a timely manner. Lineage of updated information should be provided with all output.



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS OGDEN AIR LOGISTICS CENTER (AFLCI)  
HILL AIR FORCE BASE, UTAH 84056-5149

Mr. John Moeller  
Acting Assistant Director  
Support Services  
U.S. Dept. of Interior  
Bureau of Land Management  
Washington D.C. 20240

18 August 1989

Dear Mr Moeller:

I have reviewed the Draft Report, a study of Land Information, dated July 27, 1989. My comments are as follows:  
(I am not an expert in this part of Photogrammetry)

1. The study seems complete, addressing all aspects of the problem.
2. The creation of a single mapping and surveying agency at the Federal level is the logical step to take to direct the necessary activity.
3. The format which is selected for future information should be acceptable to the widest range of users of land information data.
4. To revise old formats and different types of data will be time consuming and perhaps inexact. The worst cases may have to be retained in their present form as legal reference. Personnel selected to do this work will need a wide background of experience with different land information forms.

There should be publication of the selected format so that surveyors and cartographers become knowledgeable of required data.

Working forms for surveyors and cartographers might be developed and papers on this development published in society journals and presented at conventions.

5. While initial costs might be high, the order and stability which would gradually take place--extending to state and local governments, should allow some of these costs to be reclaimed over, perhaps, five to eight years.

6. The journals of the ASPRS and ACSM might be persuaded to run a monthly column, publishing letters (the significant paragraphs) commenting on this BLM program.

Please accept my wishes for full cooperation from those best able to assist and a healthy measure of success.

*Clarice L. Norton*

Clarice L. Norton  
00-ALC/MAKE  
Hill AFB, UT 84056

By: Mr. William French  
ASPRS  
210 Little Falls St  
Falls Church, VA 22040

# Institute for Land Information

And Its Land Information Assembly

IL/LLA

August 25, 1989

Mr. John Moeller  
Acting Assistant Director, Support Services  
U. S. Department of the Interior  
Bureau of Land Management (840)  
18th and C Streets, N. W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Reply to:

John O. Behrens, Esq.  
Special Advisor  
Governments Division  
U. S. Bureau of the Census  
Washington, D. C. 20233  
Phone: 301, 763-5308

Dear Mr. Moeller:

Pursuant to my phone conversation earlier this week with Ms. Pat Korp of your office, and in response to your request for review and comment of the Core Team Executive Summary, and of A Study of Land Information, Draft Report, both resulting from the study mandated by Public Law 100-409, I am sending you the attached comments. Each may, where this is feasible, be referenced to specific parts of the above documents, and of the Ad Hoc Committee's Memorandum of August 2 (copy enclosed), per the following code:

Document	Code
Executive Summary	ES
A Study of Land Information, Draft Report	DR
Ad Hoc Committee Memorandum of August 2	AHC

In keeping with this whole project's resolute, occasionally successful struggle against impossible deadlines, I apologize for tardiness. One reality conditioning the latter is the continuing accretion of relevant material. Some of it has come to my attention even as I write this.

Please note also that even though I work as a Special Advisor in the Governments Division of the Bureau of the Census, and serve on the Ad Hoc Committee as the representative of the Institute for Land Information, the attached comments are personal and do not necessarily represent the views of either the Census Bureau or the Institute for Land Information. I do know that the Institute for Land Information has welcomed the opportunity to be of service to the Study, and stands ready to do whatever it can in the future to help.

Sincerely,

*John O. Behrens*  
John O. Behrens



## Comments on Materials Resulting from Study of Land Information per PL 100-409

1. In contrast with Core Team recommendation (ES-p.6, DR-p.54) that a multi-echelon, multisectoral commission be created with the authority, personnel, and fiscal resources necessary to coordinate LIS activities at all government levels, the Ad Hoc Committee has proposed (AHC-p.7) "that a single federal surveying and mapping agency be created. As part of the same proposal, AHC recommends establishment of "an independent entity" such as an "LIS Commission" to "provide leadership and coordination" for all levels of government and the private sector. The proposal regards "immediate authorization" of the LIS commission as "critical" even though it "should provide" only an "interim solution." The AHC proposal does reflect the sentiment of a majority of the AHC members who voted on it at the meeting of July 21 last. The proposal does not reflect my sentiments.

It has been an honor to serve on the AHC, a hard working, dedicated group, and I do share with my AHC associates some awareness of the surging, sometimes frenetic, frequently self-serving interest in land information systems today. The need for something better, with progress in cost effectiveness and equanimity matching the marvels of hardware, is increasing daily. As the AHC says, "all levels of government" are spending many public dollars ("billions") to "address the problem."

To me, however, the key words there are "all levels of government." With something like land information, we ("all levels of government" and the private sector) are all involved. Our task is to make that joint involvement more effective, so that together we can identify, pay for, implement, and maintain the solutions to our LIS challenges.

From somewhere within that basic, decidedly rugged 39-agency terrain that comprises the Federal part of the LIS environment, a "single federal surveying and mapping agency" may naturally evolve. Obviously it has not happened just because people say it should (DR-p.18,p.25). On the contrary, its best chance for viable birth would seem to be surviving some process of natural selection. Creating a new agency now by fiat may suggest the achievement of a desired organizational purity, when the more likely result is exposure of a target, to the detriment not only of the Federal part but also of the other "basics," namely, the State and local portions of the LIS environment.

The present overriding need is coordination in a framework of deliberate, abiding cooperation that stretches up and down and beyond three tiers of government. A commission brings no magic to satisfying that need. It does, however, provide the realistic framework for the comprehensive leadership and total commitment necessary for sustained planning, funding, and action at all levels.

2. Several of the AHC comments improve the ES, adding the strength of the specific (example: 8 conclusions from "Previous Studies," AHC-p.2,3) and the rhythms of reality (example: "This framework must facilitate the sharing of information. . .," AHC-p.2,top).



Ottawa, Canada  
K1A 0E4

3. Whenever connotations involved are not specifically mentioned, or left to the vagaries of subjective inference, I would avoid use of the word "national" and choose something like "nationwide" (DR-p.20, no. 2, no. 5; AHC-p.3,4,5). The same extreme care necessarily conditions use of the word "Federal" (AHC-p.3). Given the substantial discord such terms spontaneously generate in so many places, especially about information concerning use, disposition, and development of real property, those suggesting change need to be crystal clear about what "national" and "Federal" mean and what they do not mean.

4. Mr. Bishop Dansby, Chair of the Committee on Improvement of Land Records of the ABA's Real Property, Probate and Trust Section, sent me a copy of his response to you of August 18, regarding pages 29 and 34 of the DR. I like his response.

5. In the paragraph entitled "Summary" on page 22 of the DR, the second last paragraph should begin with "The Institute for Land Information" instead of "The Institute of Land Information."

6. I would encourage a further careful review of the section on "Federal Government" in DR, pages 39 and 40. Though several of the points made there have merit, the essential of Federal leadership in the achievement of better land information systems needs extremely thoughtful definition and an enlightened implementation. Through what it does the Federal Government can inspire, stimulate, induce, prod, possibly help finance, cooperate where possible, and simply be the good example. In some situations it can indeed provide incentives. With regard to that priceless ingredient of compatibility, the Federal Government leads most effectively when what it does naturally induces compatibility as the voluntary choice of reasonable people, such as those who establish and implement LIS policies in governments throughout the country.

*John O. Behrens*  
John O. Behrens

August 22, 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, NW  
Main Interior Building, Room 5622  
Washington, D.C.  
U.S.A. 20240

Attention: Mr. Pat Korp

Dear Mr. Korp,

Enclosed please find our review and comments on the initial draft of the Land Information Study. We are interested in your efforts to set up a land information system in the U.S.

We would appreciate it if you would keep us up-to-date on your progress by including us in your mailing list.

Yours sincerely,

*Mosaad M. Allam*

Mosaad M. Allam  
A/Director  
Geographic Information Systems Division  
Surveys, Mapping and Remote Sensing Sector  
615 Booth Street  
Ottawa, Ontario  
K1A 0E9

enclosure



**Review of the Draft Report  
on  
A Study of Land Information  
(U.S. Department of the Interior)**

The report was reviewed carefully with particular attention being paid to its application in the Canadian context.

It is interesting to note that in Canada we are doing the same thing for our national Geographic Information System with one major difference. In Canada, we consider parcel-based land information as one of the several layers of information of the total Geographic Information System. In our view, since the geographic position is determined by the Universal Transverse Mercator Coordinate System, it is not necessary to collect data on a parcel basis for all the layers of the information. We feel that a segregation of land information from other layers of georeferenced information will still create a duplication which we want to avoid altogether.

The report is very comprehensive and gives clear objectives to achieve a very practical land information system. The treatment of land related information as a capital resource is what we want to give a political clout to the often unquantifiable benefits of the information. Information system is an investment in the national interest and must be fully supported by all levels of government and private industry.

The scenario provided by the report on the current status of information system is very real. The information is collected by numerous agencies based on the norms established to fulfill their mission or mandate resulting in differences in standards, formats, contents, and reference systems. Data exchange between agencies has become a nightmare forcing agencies to re-collect the data first-hand. To avoid this duplication and to serve as a focal point for leadership on a national base, we in Canada have established a GIS Division in the Surveys, Mapping and Remote Sensing Sector of the Department of Energy, Mines and Resources. In addition, there is an Inter-Agency Committee on Geomatics to coordinate the activities of various federal departments in matters related to GIS.

Therefore, we can see both the U.S. and Canada are moving in the same direction as to the management of geographically referenced information systems. One thing that strikes my mind is the elaboration of data security concerns. Although it has been mentioned that a mechanism for clearinghouse responsibilities is needed, not much has been said about the role this mechanism will

.../2

play. Other important aspects are authenticity, up-to-dateness and accuracy of the information. As the land information industry grows to maturity, there will be numerous value-added products in the market. The question of copyright and accessibility will become very important and in our view, these are considerations that should be addressed in the design of the system.

With regards to the custody of databases, it is interesting to note that you have decided to keep the "mission-specific" information in the respective agencies with responsibility for maintenance and upkeep. In Canada, we have agreed on the same philosophy to keep the databases decentralized with a federal national network for management and administration.

We are very thankful to you for providing this draft report to us and for giving us an opportunity to review and comment. It is indeed a credit-worthy report and one that brings into focus the efforts expended by our two countries to meet the needs of land-related information.

Received by  
Geographic Information Systems Division  
Surveys, Mapping and Remote Sensing Sector  
Energy, Mines and Resources Canada  
615 Booth Street  
Ottawa, Ontario  
K1A 0E9





## INSTITUTE FOR LAND INFORMATION MANAGEMENT

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Mr. John Moeller  
Acting Assistant Director, Support Services  
U.S. Department of the Interior  
Bureau of Land Management  
18th and C Streets NW  
Main Interior Building, Room 5622  
Washington, D.C. 20240  
USA

August 21, 1989

Dear Mr. Moeller,

Professor Gordon Gracie has passed on to me a draft of the Land Information Study for review. It is indeed encouraging to see the U.S. Federal Government moving forward on a Land Information System project of this magnitude.

As some background, it may be useful for you to know that I am familiar with the situation in the United States as I am a US citizen, was raised and educated in the USA. I came to Canada in 1987 to take the chair of a special professorship in Digital Mapping and Spatial Data Management set up by the Province of Alberta as part of their effort to develop a Land-Related Information Systems Network. Subsequently, I have taken the position as Director of the University of Toronto's Institute for Land Information Management.

Since taking on the directorship of this institute, I have worked with consortia of private industry on proposals for developing a strategic alliance in Ontario for the development of a land-related information systems industry. It is projected to be a \$100+ million project with some estimates for the first ten years approaching 1 billion.

As you may know, this institute has a research participation agreement with the National Institute for Standards and Technology and is a voting member of the Canadian General Standards Board Committee on Geomatics. I serve as the Vice-chairman of that national committee.

I am very excited with the overall vision expressed in "A Study of Land Information." I have been convinced for some time that distributed systems such as the one you suggest are the only workable solution, especially given the organizational dynamics of the stakeholders.

Management issues are indeed critical to the success of any information system, particularly distributed information systems. However, management should recognize that many technical issues of distributed system implementation, management, and evaluation have not been completely solved. Thus, both management and technical obstacles need to be overcome in the development of the LIS network.

1

It may prove difficult to separate technical issues from management issues since with a distributed network the two will interact quite profoundly. In fact, shortcomings in the technical sphere can precipitate management problems of unforeseen proportion, possibly overwhelming in complexity and scale. In other fields the application of techniques from the field of artificial intelligence have been used to manage large networks. The development of intelligent aids to LIS network management would be a valuable addition to proposed research topics for your commission to consider.

One might argue that there is an overemphasis on the "data" aspects of land information. We have named our institute "Land Information Management" because of the importance of developing the understanding, models, techniques, and methodologies for long-term management of land information in contrast to an emphasis on land data capture. Part of this is the formalization of specifications for transactions on land-related databases that preserve consistency and integrity.

We are beginning the third year of a research project on formal specifications of integrity-preserving transactions for land-related database system for the Department of Energy, Mines, and Resources. Several publications reporting the first phase of the research are in the process of being released. To our knowledge it is the first study to model, in detail, specifications for carrying out parcel merge and parcel split transactions on a cadastral database using techniques such as automatic theorem proving. Furthermore, our efforts included a data modeling exercise that may help contribute to development of a commonly understood data model for cadastral databases as suggested by your document.

Reliance on a parcel-based land information system can present some problems down the road. I quite agree with your general argument for using the parcel as the basic areal unit, but we have found that defining "parcel" can be an eye-opening experience. In at least one instance it was found that differing definitions of "parcel" agreed 60% or more of time with each other when their spatial definitions were compared. Still, 30% of several million parcels represents a substantial problem to reconcile.

This will be a particularly knotty problem in your network of LIS that span Federal, State, and local level land record-keeping organizations. And further highlights the importance of standards. Formal specifications on mapping from one "parcel" definition to another is one of the most effective ways of handling the problem. My feeling is that it is the most reasonable. Developing such a geographically-oriented meta-data modeler might become a high priority for your commission.

The prominence given standards in your document should be applauded. There has been need for a National LIS Commission for some time. However, the recommendation to charter the commission with sufficient authority to enforce, or directly reward, adherence to basic standards may be ill-advised. Compliance with standards, unless made statutory by law, is best done voluntarily.

Standards set through consensus and use tend to be supportive of user needs. On the other hand, standards that are imposed run the real risk of foreclosing future developments and therefore accomplishing quite the opposite effect to what they were originally envisioned. As an aside to the standards recommendations, you may want to check with Henry Tom about the idea of the Commission being the liaison between agencies and NIST. The impartiality of NIST might, in the end, be better served using a slightly different arrangement.

It was refreshing to see education included in your recommendations. As part of our education program we hold a course for the Association of Ontario Land Surveyors on GIS in which leaders from academia, government, and industry serve as instructors. It is the kind of integrated program that I think you have in mind to serve working LIS professionals.

Passing reference to components targeted to professors and academicians does not do justice to education and research needs that the effort will require. In the case of professors and academicians there is a very real need to link research components with university environments.

2

INTERNATIONAL SYMPOSIUM ON MARINE POSITIONING  
Rosenstiel School of Marine & Atmospheric Science  
University of Miami, MIAMI, FL 33149 (USA)  
15 - 19 October 1990

ORGANIZED BY: Marine Geodesy Committee/Marine Technology Society  
SYMPOSIUM DIRECTORS GENERAL CHAIRMAN TECHNICAL CHAIRMAN  
Dr. Muneendra Kumar Dr. Gary W. Hill Capt. Mat M. Ehridge  
Dr. George A. Maul

16 August 1989

Ms. Pat Korp  
Bureau of Land Management (840)  
18 th & 'C' Streets, NW  
Main Interior Bldg., Room 5622  
WASHINGTON, DC 20240

Dear Ms. Korp :

First, I send my sincere congratulations to all those who initiated the study on LIS and worked so hard to produce this excellent and timely effort.

As requested, I am enclosing my comments on the "Initial Draft" of the Land Information System study (ENCLOSURE 1).

With best regards,

Yours sincerely,



Muneendra Kumar,  
Chairman,  
ACSM Committee on Marine  
Surveying and Mapping  
MTS Committee on Marine  
Geodesy.

LIS curricula should not be cast in stone from the outset. There is much that remains to be formalized and learned about this very new field. It is this educational/research realm that will determine the long-term success, or failure, of the LIS Network.

In my experience I have observed several efforts that have faltered or stalled because of the lack of managers with a rigorous education. Often technical training is taken as a substitute for a broader-based education. This narrows the perspective of management and can result in loss of a strategic perspective and directions.

One of the missions of the Commission should be to promote the support of research-oriented professorships, grants, and other projects at universities. These should be directed towards long-term research projects aimed at generating knowledge and knowledgeable graduates.

I am very excited about the vision expressed in this document and hope we can, in some manner, contribute to its realization. As you know we are actively working with the National Institute of Standards and Technology and through that work hope to contribute indirectly to your efforts. However, let me emphasize that we would like to be able to directly contribute to your efforts in any manner appropriate to our institute. I would like to encourage you to contact me should you wish to discuss how we may help in this important undertaking.

Sincerely,



Vincent B. Robinson, Director  
Associate Professor of Surveying Science

**A STUDY ON LAND INFORMATION**  
(Dated 27 July 1989)

GENERAL COMMENTS : Even though it may be expedient to carry out only "A Study on Land Information" under Public Law 100-409, it may still be worth while not to ignore oceans which cover 75% of the earth's surface. As we realize their increasing impact and importance in our daily existence, we must study and provide sufficient scope for inclusion of marine information into the planned system.

The Exclusive Economic Zone (EEZ) area for USA consists of about three times the land area and thus must be considered into the System before it is too late. Why not call it all inclusive GEOGRAPHIC INFORMATION SYSTEM ?

OTHER PARA WISE COMMENTS :

Para. 1 (Page 4) : FGCC standards, as available, mostly define relative accuracy, while in the changing environment of digital data and satellite technologies, the defining emphasis should be on absolute (or point positioning) accuracy.

NMAS may have been defined 40 years back, but now they are in nominal existence in a "draft" stage pending their finalization over the last 10 years or more. As modifications, additions/deletions, and/or improvements will always be there, still a situation of "no decision" should not exist over such a long period of time.

Component Requirements (Page 5) :

a. "Geodetic" control can only be defined by geodetic coordinates and not by "Geographic". We have to be technically specific.

Further, geodetic coordinates do not include the "orthometric" height or elevation. As these heights constitute an important engineering requirement, they should be specified.

b. As accuracy, absolute and/or relative, is varying requirement under different applications, it should be included as an extremely important criteria in the LIS structure.

c. As the accuracy requirements would become more and more stringent in the coming years, we should also include "time" as the fourth dimension in our definition of coordinate systems.

Functional Requirements (Page 6) : In item 7, academic institutions should be included.

Last Paragraph (Page 4) : As the "civilian" charting requirement is included, the study thus should include the marine domain considerations e.g., requirement of geodetic control in the ocean side of the coast line. This is the time to look into the future and include full ramifications of the marine domain into the LIS study.

Fourth Paragraph (Page 7) : It is not clear reading this paragraph whether planning includes two systems viz., one "Earth Science Information System" under USGS and another "LIS" under the proposed Commission.

Overview (Page 9) : This section completely overlooks an overview of the marine domain, especially when the LIS will be developing into its full extension into the next century.

Geodetic Control Layer (Page 10) : The text defines the State Plane Coordinates (SPC) as the most common system; it may be the most common, but it will have practical problems across states and later, when LIS extends into marine domain.

Para 4, NRC Review, 1981 (Page 16) : The information for marine domain, if not planned for inclusion at this time, would create set backs later for a successful and all encompassing LIS.

Para 2, NRC review, 1983 (Page 17) : The SPC system would create "edge" conflicts at the state boundaries.

Federal (Page 19) : Defense Mapping Agency (DMA) should also be included (see Para 4 of OMB Report, Page 20).

Professional/Technical Associations (Page 19) : Some conspicuous absentees in the list are MTS, ION, etc.

Some academic institutions should also be included.

NMAS and FGCC Accuracy Standards (Page 43 & 44) : These standards will require a complete new review and modifications if they have to successfully apply to LIS in the 1990's and beyond. Simple extensions will not suffice.



Department of Energy  
Washington, DC 20565

APR 11 1989

AUG 24 1989

Mr. John Moeller  
Acting Assistant Director  
Support Services  
Bureau of Land Management  
Washington, DC 20240

Dear Mr. Moeller:

Your letter of July 27, 1989, transmitted a draft copy of the Land Information Study for our review and comment. We have no comments over and above those provided to you in our letter of April 11, 1989, a copy of which is enclosed.

If you have any questions, please call Tom Knox, of my staff, on 586-1191.

Sincerely,

Donald G. Trost, Chief  
Real Property Branch  
Office of Project and  
Facilities Management

Enclosure

Mr. John Moeller, Chairman  
Land Information System Study Team  
Department of the Interior  
18th and C St., NW  
Washington, DC 20240

Dear Mr. Moeller:

Your letter of March 24, 1989, to Mr. Gene H. Knight, has been referred to this office for response. Your letter asked about the Department of Energy's (OOE) development of systems for land records information.

This office maintains OOE's Real Property Inventory System (RPIS) which is a computerized data base containing detailed information on Departmentwide real property holdings. At the present time, the preponderance of data in the RPIS pertains to buildings and other structures and facilities rather than land. However, we are in the process of converting the General Services Administration's generic real property system called Foundation Information for Real Property Management (FIRM) to the RPIS which will result in our having more detailed data on DOE's land holdings. It is our understanding that 22 government agencies within the Washington, DC area, including the Bureau of Land Management, are participating in FIRM.

Enclosed is a copy of OOE's Real Property Statistical Handbook. The handbook contains data retrieved from the RPIS. Information on land holdings is found on pages 7-12. Also enclosed are 2 pages from FIRM which will give you an idea of the land information data that is being added to the RPIS.

This office does not maintain land records (deeds, maps, title reports, etc.). All land records are maintained at the OOE field office level.

If you have any questions, please contact Tom Knox of my staff on 586-1191.

Sincerely,

Donald G. Trost, Chief  
Real Property Branch  
Office of Project and  
Facilities Management

Enclosures

256 Greenwood Place 13210  
Syracuse, New York  
August 21, 1989

Mr. John Moeller  
Acting Assistant Director, Support Systems  
Bureau of Land Management (840)  
18 & C Street, N.W.  
Main Interior Building, Room 5622  
Washington, D.C. 20240

Dear Mr. Moeller:

Thank you for the opportunity to review the draft of the land information report that was mandated by PL 100-409. I also shared the report with various representatives of states who were in attendance at the annual conference of the Urban and Regional Information Systems Association last week. It was unfortunate that little time was available for a thorough review, however the general opinion seemed to be positive that such an endeavor had taken place. Those representatives with specific comments will forward them to you directly. Below are my general comments.

The report is well written and accurately summarizes basic conclusions about existing and past views on the general problems and needs regarding land information in this country. Considering the limited time and resources to prepare the report, and acknowledging the countless hours of essentially volunteer time and contributions to the study, I commend the participants, effort, and the report. It is certainly a step in the right direction and is a helpful building block.

The report, however, is disappointing in some respects, and most particularly because it does not say much that is "new". Little new information is provided about the status of conditions in the country; vision based on a linkage with broader problems could have been discussed (similar to the Parade quote); most recent problems and trends could have been described to update past reports; and discussion about opportunities, needs and solutions for the future could have been more extensive and specific. Some examples and suggestions are mentioned below.

Firstly, the report needs to make a clear statement that many people from different disciplines and walks of life can understand and agree to support (i.e. Congress and its staff). It should state a LIS focus and frame, and a multipurpose land information foundation, is essential to solve a wide variety of broad, increasing problems facing our nation. It seems we are at a more crucial point in this field at this time than any other. Accordingly, the report should more strongly state the need for taking action now on this critical issue for America's future. And further, more urgently encourage Congress to

develop and invest in such a resource for the nation, or that serious ramifications and inabilities to resolve growing problems could occur without such commitment. It seems this is the "bottom line" of the report, and virtually all related efforts, and that all sectors need to rise above individual interests to work together to make it happen.

Some specific suggestions are offered for Chapter V regarding each sector. Firstly, I found the treatment of federal agencies to be far too limited, especially since the law specifically included discussion and evaluation of "ways to improve the coordination of Federal land information activities." Some tables describing specific activities of federal agencies, particularly those with land ownership responsibilities, would have been extremely helpful. Similarly, a table of federal interests and activities by state would have been a useful resource and serve to help focus federal attention to the needs and interests of states. I was glad to read a list of the LIS activities of federal agencies will be in the final report, and hope these suggestions can be included. Also, hopefully some useful material will be compiled for the larger effort within the Federal Land Exchange Facilitation Act. Would you please keep me informed of progress and information developed as part of this work? Currently, there is a limited awareness of, and growing need for a knowledge base about federal agencies relating to LIS. With coordination between governments as a common goal, it would help state and local governments a great deal if federal agencies would work together better. For example, it is hoped that BLM and the Forest Service are working closely together as both are currently in the process of acquiring new GIS capabilities. There is a strong leadership need and opportunity for federal agencies to cooperate and work more closely together as has been evidenced in some recent exemplary examples.

The sections on state and local government provided useful information, but, a more thorough knowledge base from which to describe and understand general conditions, trends and issues is sorely needed. Though far from comprehensive, some attempt to do so was included in two papers of mine that you have reviewed. You might wish to include some of those thoughts more specifically. In addition, there are a wide variety of issues associated with the nature of government in this country as it relates to LIS development. This is important especially from the standpoint of how to interface LIS activities with defined missions of individual governments within our federal form of government. These issues need to be explored, particularly from a state and local perspective. In any case, it was great to see as much involvement and contribution as was provided by the National Governors' Association and the National Association of Counties. If in no other way, the study made a large contribution to the field by strengthening bonds with these important associations. However, as a former Town Manager, and as I recommended to you earlier, municipal interests should have been better included in the focus and scope of the report, as well as more thoroughly included in the survey.

The treatment of private sector activities and interests is limited, however unlike government, it is understandably difficult to obtain, describe and then synthesize such information. However, such a focus and understanding is increasingly important as this field is faced with growing issues associated with defining the appropriate roles of public and private entities. The report does not include a number of private sector activities and interests, and it could be a danger to not do so in future efforts. Also, I am concerned about and somewhat disagree with the statement on page 36 which states, "(t)he need is driving the industry." Recently, some colleagues and I are seeing a danger that perceived market opportunities are and will increasingly drive technology development and adoption,

rather than focusing on needs and solutions to the problems in our country. There are numerous examples of how this has occurred in other aspects of the information technology industry. Our problems are too severe to let this happen, thus public sector leadership, focus and attention is essential.

Also within the section about the private sector is some discussion of infrastructure management and utilities. It should be noted that these activities are generally public, or atleast franchised, and accordingly should be considered in the section on public interests. As a point of clarification, it is commonly understood that infrastructure includes utilities, and utilities include, as a minimum, water and wastewater, in addition to gas, electric and telephone as noted. It might be helpful to review and use definitions developed by the Census Bureau.

Most of my thoughts about each sector are included in the above discussion about Chapter V. In general, I believe the report could be strengthened with more indepth investigation and discussion in some of the other chapters, but I understand the limitations associated with the report. It includes a good attempt to address coordination and institutional issues, but more specific barriers and suggestions could be discussed. Beyond benefit/cost analyses, there is also a need to articulate the larger financial needs and issues associated with this endeavor. The report should elaborate on future needs to help guide future efforts. For example, what further research is needed? What gaps exist in current efforts, definitions of roles and responsibilities, data, standards, etc. What should be the top priorities of this nationwide effort?

There are also some difficult policy questions. For example, what is the linkage between LIS initiatives and efforts to build a national digital cartographic database? What is the appropriate role of the public and private sectors, including implications and lessons learned from efforts to privatize development of information about the country (i.e. Landsat)? Further, what is the relationship between these activities and general information technology, federal information resources management, federal scientific and technical information, and general information policies being developed today and in the future at all levels of government? Additionally, how will public access and privacy issues be addressed?

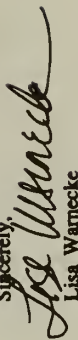
Finally, as recommended, a federal focal point, whether it be a Commission or agency, is very much needed. What specifically would be its focus, mandate, resources and authority, especially within a larger context and in relationship with other federal entities and activities? Some discussion about these questions would help pave the way for future action.

A few editorial remarks are as follows. There does not appear to be a definition of guidelines, though standards are defined. I am curious how the studies were selected for review in Chapter IV. All but one were national level studies, with the other from one state. High quality reports have been developed in other governments as well. In fairness, and for consistency, they all should be listed together. Further, a reader unfamiliar with this field might inaccurately think that conditions in one state might reflect those in other states, and we know this is not necessarily true. Also, it seems that document referencing is handled somewhat inconsistently. Some studies are referenced, i.e. Slama, 1983, on page 43, and others are not, such as Automation, Inc.'s market survey which is mentioned

twice. Such references would be helpful for the reader to obtain further information. I would also appreciate references to my work as it was one of the building blocks also used to prepare the report.

I hope the above comments and suggestions are helpful. The report is a useful one and represents a great deal of work on the part of your staff, committee and others. I look forward to seeing the final version and learning of related future plans.

Sincerely,



Lisa Warnecke



# United States Department of the Interior

GEOLOGICAL SURVEY  
RESTON, VA 22092

In Reply Refer To:  
MGS-890710  
Mail Stop 516

AUG 3 1 1989

Memorandum

To: Acting Assistant Director, Support Services  
Bureau of Land Management

From: Director, Geological Survey

Subject: Draft Report--"A Study of Land Information"

Thank you for the opportunity to review the draft report "A Study of Land Information" dated July 27, 1989. The report is both well written and organized, and is responsive to the specific topics listed in P.L. 100-409, the Federal Land Exchange Facilitation Act of 1988.

We strongly endorse the basic premise of the report that "land information is a national asset." A principal role of the U.S. Geological Survey (USGS) is to develop and maintain multipurpose digital spatial data bases comprised of earth science and land information that are useful to the public for a wide variety of purposes. This same data is also useful to the USGS for generating, revising, analyzing, and managing information including standard, derivative, and digital products. Although the USGS does not collect information based on land ownership parcels, the value of earth science data bases to the public would be increased if the data could be easily related to land ownership parcels.

The USGS agrees that educational programs in land information are needed to provide the appropriate skills to manage both the administration and technology associated with future programs. We strongly approve of the National Science Foundation-sponsored centers associated with the mapping sciences, and geographic and land information systems, and will cooperate with them to the extent possible on research agenda items and implementation projects.

We agree that information about the land should be developed and recorded so that compatibility of data that is collected by different agencies, at different levels of government and for different purposes, can be exchanged, compared, or aggregated more efficiently. Many of the examples cited in the report of ongoing activities at the Federal, State, and local levels substantiate the need for increased emphasis on coordination and development of standards to ensure the development of compatible land information systems. As recognized in the report, USGS coordinates Federal mapping which contributes to the National Topographic Map Series in accordance with Office of Management and Budget (OMB) Circular A-16. We concur that Circular A-16 should be revised and updated to reflect mission, organizational, and technological changes that have taken place since the last revision of the Circular in 1967.

In 1983, the OMB chartered the Federal Interagency Coordinating Committee on Digital Cartography (FICCDC) which is chaired for the Department of the Interior by the USGS. This Committee has been coordinating Federal activities in digital cartography, geographic information systems, interdepartmental spatial data management, and related standards development. At the time of the recent rechartering of the FICCDC, OMB requested a study, that is now ongoing, to suggest an expanded scope and direction for the FICCDC and to consider the revision of Circular A-16. Some of the recommendations in the Land Information Study Report closely parallel those being suggested for future activities of a rechartered FICCDC.

It is important that an executive level coordinating body be established to provide oversight, leadership, and coordination in the management of land information. We do not agree that it is necessary to establish a new Commission. We believe consideration should be given to incorporating the functions of this Commission into an existing entity such as a rechartered FICCDC. We also believe that the proposed functions of this entity should be a program oriented coordinating body, not a policy or a budgetary body on the management of Federal surveying and mapping functions.

The longstanding recommendation to create a single surveying and mapping agency within the Federal Government, restated in your study, is worthy of consideration. We believe that prior studies have established the basis for the consolidation of some functions. Further action on the implementation of any consolidation requires an executive-level decision.

We fully support cooperative programs with other Federal agencies and with the States. In fact the USGS has cooperative Federal/State programs which provide information on the Nation's hydrologic and geologic resources. The USGS has regularly scheduled coordination meetings with State geologists and also meets regularly with State Map Advisory Committees. Each of these activities supports the development of integrated national data and also supports Federal, State and local needs.

The USGS recognizes that in this country, counties and local governments have the primary responsibility for land ownership records management, which is an integral part of a land information system. We concur that there is a need to establish a State-level coordinating mechanism to provide a focal point for communication and for coordination of standards activities within the States. A nationwide network of State offices, and within each State, a network of county offices would need to be established to assist in the data coordination process.

We commend you on the excellent quality of this study, and if we can be of further assistance, please call Lowell Starr at 648-5747.

Dallas L. Peck



# United States Department of the Interior

BUREAU OF RECLAMATION

DENVER OFFICE

P O BOX 25007

BUILDING 67, DENVER FEDERAL CENTER

DENVER, COLORADO 80225-0007

D-5410

U.S. GOVERNMENT PRINTING OFFICE: 1985

international activities. This type of summary would be preferable to the state by state and/or county by county descriptions in the preceding pages.

On pages 37-41, the roles and responsibilities of the various entities involved in land records systems (counties, states and Federal government agencies) are discussed. The complexity of a multipurpose land information system that brings together information on real property, land legal descriptions, environmental and natural resources, and socioeconomic data sources is recognized. The need for interorganizational cooperation is also recognized. Reclamation will support whatever cooperative efforts are appropriate.

On pages 43-45, the need for uniform guidelines and standards is discussed. Reclamation has and will continue to support the development of uniform standards that allow for the exchange and sharing of data between and among organizations. In particular, Reclamation will continue to provide staff support to the Federal Interagency Coordinating Committee on Digital Cartography and the Interior Coordinating Committee on Digital Cartography.

On pages 47-51, where benefit/cost analysis is presented, this could be even more abbreviated and general. Given the political (and budgetary) separation of the participating entities (private, state, county, city and Federal agencies), only the most general budgetary comments would suffice. The analysis could be more promotional in tone. Text could be limited to a review of estimated total costs nationally to support duplicative manual and/or automated systems and to a discussion of the lost opportunities of not being able to simultaneously display map overlays and supplemental graphic data sets.

On pages 53-56, recommendations are summarized. Reactions of Reclamation to the recommendations follow:

\* Standards for nationwide parcel information are being created by the Bureau of Land Management, the United States Geological Survey, and the Forest Service. Reclamation is in the process of revising the system that inventories real property under Reclamation's jurisdiction and will cooperate to the extent possible in matching common data standards as these standards are made available.

\* Reclamation endorses the concept of a unified land information system that shares common components, uses already existing data sources, and is linked through a common geodetic coordinate system.

\* Reclamation endorses the need for standardized parcel data descriptors and recommends that an interagency group be established to oversee development. Reclamation would like to be represented on such a team.

Memorandum

To: Assistant Director, Support Services, Bureau of Land Management, Washington DC, Attention: BC-840 (5622-MIB)

From: ~~Deborah~~ Assistant Commissioner - Resources Management

Subject: Lands Information Study Draft Report Comments (Real Property Inventory)

This is in response to your July 27, 1989, letter requesting comments on the draft report "A Study of Land Information" and to your July 14, 1989, letter requesting comments on the draft "Executive Summary" of "A Study of Land Information Systems." The following comments refer to pages in the draft report "A Study of Land Information."

Pages 9 to 23 are well written and contain very useful summaries of activities and recommendations on development of "land information systems" (LIS) under the variety of names and acronyms that are being used.

On page 25, the report acknowledges the Bureau of Reclamation's (Reclamation) role in the development of LIS and the use of land information.

On pages 27-33, individual state, county, and local governmental units' systems are reviewed. The LIS field is changing rapidly. New systems are continually being developed, and systems revisions are continually being implemented. Any attempt to list individual, state, or local governmental unit systems status can never be current. The report would be more timely and enduring if systems status in all governmental levels could be described generally.

As an alternative, the status of individual systems and systems within individual states and other governmental units could be listed in a separately bound appendix or in a separate report. Another possibility could be to list all states with a status report for each state, and possibly, include a summary for those states with no reportable systems development.

On pages 33-36, is a more generic description of systems progress in land transfer and abstracting records, natural resource management, and





United States  
Department of  
Agriculture

Soil  
Conservation  
Service

P.O. Box 2690  
Washington, D.C.  
20013

\* Reclamation supports the development of an action plan to implement the report's recommendations, and will participate in the development of such a plan as appropriate.

*Raymond A. Williams*

AUG 29 1989

Ms. Pat Korp  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Street, N.W.  
Main Interior Building - Room 5622  
Washington, D.C. 20240

Dear Ms. Korp:

Thank you for the opportunity to review the draft report of "A Study of Land Information" dated July 27, 1989.

In general, we believe the report is well organized and is well written. We would like to see the appendix that describes federal agency GIS activities so we could also provide review comments. On page 25, the SCS needs to be listed as an agency in Agriculture involved with GIS.

We have some concerns over the recommendation for the establishment of a LIS Commission which would have federal coordination responsibilities. The Federal Interagency Committee on Digital Cartography (FICCDC) has been coordinating federal GIS activities for 4 to 5 years. For the most part, there are only subtle differences between Land Information Systems (LISs) and Geographic Information Systems (GISs) so we would not want to support two different groups responsible for coordination. We believe that existing coordination efforts need to be accelerated particularly as they relate to spatial database standards data sharing. However, rather than support the establishment of the LIS Commission, we support an expanded role of the FICCDC.

Sincerely,

*Robert R. Shaw* Acting for

ROBERT R. SHAW  
Deputy Chief for Technology

cc:  
Gale W. TeSelle, Director, Cartography and Geographic Information Systems Division, SCS, Washington, D.C.  
Rex Hartgraves, Associate Deputy, Forest Service, Rosslyn, Virginia





FRANKLIN COUNTY AUDITOR  
PALMER C. MCNEAL

MEMORANDUM

TO: The Franklin County Commissioners

FROM: Stuart Davis, Deputy Auditor

RE: "A Study of Land Information Systems"

DATE: August 25, 1989

Per your request, I have reviewed the document "A Study of Land Information Systems - Draft Executive Summary". In this document, a land information system (LIS) is defined as "...the ability to link a multitude of land related attributes, often from many different sources and maintained by many different agencies, to a unique geographic location or area". This paper deals with coordinating land information systems (LIS) across the country at the national level. It correctly identifies the inherent problems involved in the standardization of an emerging technology. Various agencies at all levels of government have implemented (LIS) technology, but because the focus of most of these projects deal with immediate agency needs, there have been few coordinated efforts to link these various projects into a broader, statewide or national information network.

It proposes the establishment of standards and strict guidelines to ensure compatibility across multiple levels of government. Although the development of standards and guidelines is essential, careful thought should be given to the approaches presented here. Rather than a governing body, I see the state/federal involvement more as a facilitator of direction. The state of Ohio has taken a similar approach where representatives of various local government associations, (i.e. municipalities, counties and state agencies) develop standards jointly, with the individual associations reviewing the standards that directly effect them.

A large portion of land information is currently captured, maintained and utilized at the local level. If standards are to be developed, the local level must be involved in this since they are directly effected by these standards. The concentration should be on the education, sharing of information and the cooperation between all governmental levels, for a more efficient government.

One positive direction is a strong emphasis on education; educate don't regulate. The education of the various levels of

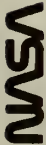
government is the first step in the development of standards. Once the issues are jointly identified and understood, a logical approach to these guidelines will be defined.

The sharing of information is the focal point of this document. If standards are not in place, information will not be able to cross political boundaries. Access of this information should be made available but only in the computer format that agency is currently using. It should not be up to that agency to translate that data to any requested format. The cost associated with this translation should be at the expense of the requestor.

A focus should be made on positive incentives (i.e. federal grants and inducements) rather than the enforcement of standards that could end up costing the tax payers at the local level. Under an incentive program, would existing LIS projects receive support for their initiative or be punished relative to the backing given to new projects? Will existing projects have to pay to meet the newly imposed standards?

The creation of federal and state level commissions to help coordinate efforts nationwide would be feasible and beneficial. However, the purpose of the commissions should be limited to guiding the development of LIS projects, not mandating procedures. Procedures should be collectively agreed upon by the agencies involved.

The proposed recommendations will be extremely difficult to implement and enforce. How they would be enforced is not readily identifiable. Rather than imposing standards and guidelines, they should be mutually agreed upon by all parties. The primary functions of this proposed commission should be to educate, counsel and coordinate activities, not dictate standards.



National Aeronautics and  
Space Administration  
Washington, D C  
20546

Reply to Airmail:

NXG

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C Streets, N.W., Room 5622  
Washington, DC 20240  
Attn: Pat Korp

Dear Ms. Korp:

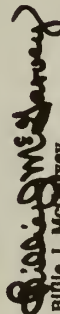
Reference is made to your letter dated July 27, 1989, addressed to Reviewer, requesting comments to the "Initial Draft" of the Land Information Study mandated by Public Law 100-409.

We have reviewed the subject draft and have no objection to its recommendation to establish a National Land Information System (LIS). The proposed data to be contained in the LIS would be of extreme value to all levels of Federal and State Government, as well as local commissions and public utilities, to better manage and protect such limited resources. We agree with the common approach proposal to the LIS, its basic components as stated in the initial draft, and the feasibility of creating the proposed LIS Commission.

Our only concern would be with any mandated manpower and resources that may be required by agencies to implement such a massive initiative as a LIS. We wish your study team success in obtaining the Congressional appropriation estimated in the draft report to fund this important endeavor.

Please contact Mr. Norman J. Willis, Director, Facilities Operations and Maintenance Division at 453-1950 for any further assistance you may require concerning this matter.

Sincerely,

  
Billie J. McCarvey  
Assistant Associate Administrator  
for Facilities Management

AUG 3 0 1990



Australian Surveying &  
Land Information Group  
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Cnr. Cameron Avenue &  
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Belconnen ACT 2617  
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Telephone: (0621) 52 7095

Mr John Moeller  
Acting Assistant Director Support Services  
US Department of Interior  
Bureau of Land Management (840)  
18th & C Streets NW  
Main Interior Building - Room 5622  
WASHINGTON DC 20240  
UNITED STATES OF AMERICA

24 August 1989

Dear Mr Moeller,

Thank you for providing a copy of the draft report 'A Study of Land Information',

There are many similarities between developments in the US and Australia. Many of the draft report's recommendations provide positive reinforcement for the directions Australia is taking.

In Australia, we take a broader view of 'land information' and 'LIS', as we consider these as embracing all types of geographically referenced information and not just cadastral parcel data.

I would be grateful if you could provide me with a copy of the finalised report when it becomes available.

I have enclosed the following publications from the Australian Land Information Council (ALIC) which may be of interest:

- ALIC Annual Reports 1986-87, 1987-88
- Australasian LIS Status Reports 1986-87, 1987-88
- National Strategy on Land Information Management
- ALIC News March 1989.


ALIC is the peak intergovernmental council for land information in Australia.

Also enclosed is a recent edition of 'Land Information News from the Commonwealth' (LINC), produced by AUSLIG.

AUSLIG is the Australian (Commonwealth) Government's surveying, mapping and land information agency and represents the Commonwealth on intergovernmental councils such as ALIC. AUSLIG also provides the permanent Secretariat for ALIC and its technical subcommittee, the Australasian Advisory Committee on Land Information (AACLI).

I look forward to hearing from you once your report is finalised.

Yours sincerely,



Keith C. Bell  
Director, Commonwealth and National  
Coordination of Land Information



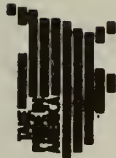
United States Department of the Interior

MINERALS MANAGEMENT SERVICE

ROYALTY MANAGEMENT PROGRAM

P.O. BOX 25186

DENVER, COLORADO 80226



IN REPLY  
REFER TO

SHD-ISB  
Mail Stop 654

AUG 30 1989

Memorandum

To: Acting Assistant Director, Support Services  
Bureau of Land Management

From: Chief, Systems Management Division  
Minerals Management Service

Subject: Land Information Study

Thank you for the opportunity to review the draft of the Land Information Study. As I stated in my earlier letter on this subject, the Royalty Management Program (RMP) supports efforts to improve land information systems. RMP does not, however, directly use land surveying and mapping information.

RMP's primary responsibility involves the collection and disbursement of royalties from Federal and Indian leases. Information from our data bases is shared with other Federal and state agencies. Facilitating the transfer of this data among interested parties within the context of an improved land information system could enhance RMP's ability to collect and disburse royalties and related information with greater accuracy and efficiency. Therefore, I concur with the proposed recommendation.

  
H. Erlich



LOUIS HEIMBACH  
COUNTY EXECUTIVE

August 30, 1989

Dear Mr. Moeller:

John Thomas, NACO's Executive Director, has shared with me your Draft Executive Summary for a Study of Land Information Systems. He has asked me to review this document and to forward any revisions or comments directly to you.

In general, I favor the development of a land information system that permits the exchange and flow of information between and among various government levels. Such a system would have to be built-in safeguards to prevent abuse of the system and assurances that those seeking information will work through designated land information agencies at the Federal, State, County and municipal levels.

In my own County, we have established a County Real Property Manager within the County's Real Property Tax Service Agency. The Manager oversees the management of all County owned properties, has access to all land transfers on a daily basis and is the County's vehicle through which it transmits land information to other levels of government.

In New York State, local governments have been delegated broad land use powers and correspondingly, a large share of the responsibility for the components of land information systems at the parcel level. Unfortunately, it is often difficult to retrieve efficiently, and often impossible among our County's forty municipalities, to relate to relevant information in other land information files. To overcome this, we created a County Real Property Tax Service Agency to begin to systematically organize the County's real property information on a parcel by parcel basis. We are beginning to investigate how best to integrate this data with geographic information and with the Bureau of Census' 1990 Tiger File to build a data model for each parcel.

I think that our experiences with land management are instructive and could serve as an impetus for all levels of government and the private sector to develop a commitment to the land information system concept.

Sincerely,



Mr. John Moeller  
Acting Assistant Director, Support Services  
United States Department of the Interior  
Bureau of Land Management  
Washington, D.C. 20240



## United States Department of the Interior

NATIONAL PARK SERVICE  
GEOGRAPHIC INFORMATION SYSTEMS  
P.O. BOX 23787  
DENVER, COLORADO 80225-0287

IN REPLY REFER TO:

August 31, 1989

Ms. Pat Korp  
U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Dear Ms. Korp:

I appreciated the opportunity to review the draft report, *A Study of Land Information*, mandated by Section 8 of Public Law 100-409. In general, I laude the style and substance of the subject report. The report is well written and appears to be an objective portrayal of the status of land information systems (LIS) at all levels of usage. As such it appears to represent a balanced consensus on a complex, important, politically sensitive and potentially emotion laden issue.

The following are more specific comments or concerns about the draft report.

1. The section on barriers (i.e. Need for... Leadership, Authority, Broad-Based Commitment, Appropriate Skill-Mix, Focus for Funding, and an Institutional Framework) is right on target, based on our experience with implementing a NPS-wide integrated remote sensing/GIS program.
2. I am comfortable with the definition of LIS as used throughout the report and hope that it is adhered to when any recommendations are implemented. Nevertheless, I still have a nagging concern that steps to implement many of the LIS proposals may spill over into areas more appropriately distinguished by geographic information systems (GIS). All the guidelines and standards envisioned for LIS data seem appropriate. However with the exception of data exchange standards, LIS standards would not be wise or probably possible to implement for most thematic data contained within a GIS. For example, it would be almost impossible to come to consensus on classification and accuracy standards for GIS data, except in the broadest sense.
3. I have a concern somewhat similar to that expressed in No. 2 regarding the creation of a single mapping and surveying agency. The charting, geodesy, surveying and multipurpose cadastre work seems to be something, which most agencies or users could support in principle. The concern again relates to what is considered "civilian mapping". If such an agency was strictly limited to production of DEMs, typical DLGs (e.g. hydrography, hypsography, roads, public lands survey, etc.) and the aforementioned, I think consensus could be reached. Although the report indicates that "mission-specific" information would still be up to individual user, the actual implementation of such a sweeping proposal sometimes includes more than the designers intended. However, the concept is a good one that deserves more study, including the topic of what mechanisms would be instituted to assure meeting the needs of the wide variety of users.

In theory the creation of a single mapping and surveying agency could improve efficiency and effectiveness. In practice however, one large monolithic organization may suffer from the same problems as the multiple-agency condition of today.

I have assumed that I was reviewing this report because of my position as Director, Remote Sensing Applications Division, American Society for Photogrammetry and Remote Sensing (ASPRS). However, the views expressed would have changed little, if I were responding in my professional capacity for the National Park Service. I apologize for the lateness of my reply and I hope my comments are useful.

Sincerely,

Maurice O. Nyquist, Ph.D.  
Chief, Remote Sensing Branch  
GIS Division - WASO

COUNTY OF SACRAMENTO

OFFICE OF THE ASSESSOR  
700 H STREET, SACRAMENTO, CA 95814



ROGER G. F. FONG, ASSESSOR  
LOWELL L. BOWMAN, ASSISTANT ASSESSOR

August 11, 1989

National Association of Counties  
c/o John P. Thomas  
Executive Director  
440 First Street NW  
Washington, DC 20001

Dear Mr. Thomas:

The Sacramento County Assessor's Office maintains a substantial land, parcel, mapping, and electronic information system, which appears to meet most or all of the guidelines put forth in the Draft Executive Summary provided by your organization.

We have included a number of enclosures which demonstrate how our parceling system is designed, and what electronic information is available. For additional information, may we also suggest that you contact the Assessor's Standards Division of the California State Board of Equalization, P. O. Box 942879, Sacramento, CA 94279-0001, for their feedback and, at least, the publication entitled AH 215, Standards for Assessor's Maps, Parcel Numbering, and Tax Rate Systems. Assessor's Handbook 222, Standard Form List, lists all State Board publications and is also enclosed for your review.

Sacramento County consists of approximately 330,000 land parcels, each of which is assigned a unique, 14 digit parcel number. Several mineral rights and condominium air rights are also assigned 14 digit parcel numbers and are included in the above count. A description of the parcel number and a parcel map page can be found among our enclosures.

Each parcel is also assigned a unique 6 digit use code which describes, in rather minute detail, the most recent land use of that property as observed by our field appraisers. We have included a copy of the Assessor's Operational Manual Land Use Code Procedure, which details how use codes are created and which will allow you to translate any use code in our system into a literal description of a parcel's use.

Sacramento County also maintains a data base Master Property Record Inquiry electronic information system, which details the ownership, address, mailing address, recording data/page, grantor, tax rate area, zoning, use code, neighborhood number, size, and legal

John P. Thomas  
Page 2  
August 11, 1989

description (among other things) for every parcel in the County. Our mainframe is IBM based, and that information is readily accessible via mag tape. A copy of a master property recorded has been enclosed.

The data base system also includes a Historical Ownership Inquiry File, which lists all known transfers of title (including fractional transfers), their recording date/page, as well as the grantee/grantor for all parcels. Unfortunately, electronic information on ownership does not go back much further than 1970, so this system is somewhat limited as a historical resource. A copy of the Historical Ownership screen may be found among the enclosures.

At the present time, our County is in the process of conducting a pilot project involving a GIS system (Geographical Information System) for a small portion of our County. It is our hope that in the coming years all County geographical data will be digitized and that electronic maps will be as readily accessible as their related informational data is now. Funding availability is one of the key elements that will determine when that goal will be accomplished. Even though the costs of GIS developments have declined dramatically, it is still a large investment in these days of limited governmental resources.

I would think that if federal moneys were available to help along these lines on a possible matching basis, it would very much help further the development of these types of systems. Hoping that this information is what you wanted, I remain;

Sincerely,

ROGER G.F. FONG, ASSESSOR

JERRY NOTESTINE  
PRINCIPAL APPRAISER

MK/jc  
elect.1tr

cc: Roger Fong  
Lowell Bowman  
Mike Kelley



State of North Carolina  
Department of Natural Resources and Community Development

Division of Land Resources

512 North Salisbury Street • Raleigh, North Carolina 27611

James G. Martin, Governor  
William W. Cobey, Jr., Secretary

Stephen C. Conrad  
Director

September 5, 1989

Ms./Mr. Pat Korp  
U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N.W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Dear Ms./Mr. Korp:

It is with great interest that we have reviewed your draft report entitled A Study of Land Information. Because of our Program's effort to improve land records in North Carolina, we greatly appreciate the need for and support a common approach to land information management at the federal, state and local levels. The type of recommendations discussed in the report would assist all those who are directly or indirectly involved in land information activities.

The section of the report dealing with North Carolina is somewhat out of date. The following is an updated version of that portion of the report:

The State of North Carolina instituted a Land Records Management Program in 1977. The Program has a full-time staff of eight persons, and in FY 1989-90, \$1,025,000 in matching grants were awarded to 60 counties. As of 1989, grants totalling \$4,260,000 have been awarded to 82 of the state's 100 counties for projects ranging from base maps, cadastral or property line maps, a system of parcel identifiers, and automation of land records. To date, a total of 76 counties in North Carolina have been mapped or are in the process of mapping. Thirty-one counties and three cities are using the base map data in an automated LIS. Four additional counties are expected to acquire systems in the next year. The Program is also in the process of developing state-wide standards for the local register of deeds office in the State; when these standards are implemented, much of the state's parcel level land

information will be collected, stored, and disseminated in a uniform manner.

Please contact me if you have any questions about the Land Records Management Program and our land information systems approach or if I may be of service in your efforts to improve the content and delivery of land information.

Sincerely,

*(s) Donald P. Holloway*

Donald P. Holloway  
Director  
N. C. Land Records Management Program

DPH:mfc



## The Huntsville Land Trust

U.S. Dept. of the Interior  
Bureau of Land Management  
18th & C. Street N.W.  
Main Interior Building - Rm 5622  
Washington, D.C. 20240

Dear Sir or Madame:

A letter from Mr. John Moeller recently came to the attention of the Huntsville Land Trust through the Madison County Commission. We received the Executive Summary of the LIS on August 30, 1989 and I do hope it is not too late to comment on the proposal.

The Huntsville Land Trust is a private, non-profit corporation that formed in 1987 to protect and conserve lands in Madison County. We are trying to identify scenic, geological, ecologically sensitive, and otherwise biologically diverse areas in the county, and in doing this we work with the City of Huntsville, and the County Commission to target areas that should be withheld from at least certain types of development. The system we use is a crude one--the use of TVA and USGS topographic maps to delineate areas during the ground reconnaissance process. We also do other baseline data, such as the geological features (hydrology, percolation) of an area, plus making species lists at least of the vegetation. We have done this for the USEFWS office in Daphne, AL on a wetland site, as well as for our own use.

The County Engineers use the same mapping methods (topo maps) but they hope to get in this years budget money for the Intergraph Mapping System that the City of Huntsville uses. This system contains physical features including contours, streets, elevations, and utilities. Eventually, they will include city right-of-way features such as street trees. Hydrology, geology, and soils are other features that will be added in time.

The Huntsville Land Trust is greatly in favor of this integrated information networking for land systems. As yet, we do not know how we could fit into this scheme, but the HLT is interested in guidance from other organizations and agencies in research, mapping, and data base collection, as well as the information and outreach capabilities.

P.O. BOX 43  
HUNTSVILLE, ALABAMA 35804  
(205) 534-LAND

Sept. 6, 1989

The people most involved in mapping information in the City and County area: Timothy Barnes, Planning Dept., City of Huntsville, POB 308, Huntsville AL 35804, phone (205) 532-7353, and David Pope, chief engineer for the County at (205) 532-3728. I do not have his mailing address.

If the LIS has a need for private organizations that deal with land, the Land Trust Exchange is a clearinghouse for all the member organizations, and they could be valuable to the LIS. Locally (within Madison County) we could be of service, as I'm sure the LIS will be to us.

Please let us know how we can be of assistance.

Sincerely,

*Susan F. Weber*





State of North Carolina  
Department of Natural Resources and Community Development

Division of Land Resources

512 North Salisbury Street • Raleigh, North Carolina 27611

James G. Martin, Governor  
William W. Cobby, Jr., Secretary

Stephen G. Conrad  
Director

September 26, 1989

Mr. John Moeller  
Acting Assistant Director  
Support Services  
U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C. Street, N. W.  
Main Interior Building - Room 5622  
Washington, D. C. 20240

Dear Mr. Moeller:

It is with great interest that we have reviewed your draft report entitled A Study of Land Information. The North Carolina Department of Environment, Health, and Natural Resources (formerly the Department of Natural Resources and Community Development) is fully aware of the need for better land information and the need for coordination of the land information that currently exists. Land information serves as a cornerstone for our Department's activities related to the protection of North Carolina land, water, and air resources and the protection of our citizens' health. Consequently, the land information system concept recommended in your report would certainly be of assistance in state activities such as our's, and we feel confident that the concept would be of great value at the federal and local levels also.

As you may be aware, the North Carolina Land Records Management Program (LRMP), located in our Department, has established a common land information system approach at the state and local levels within North Carolina. This program, established by the North Carolina General Assembly in 1977 to improve land records and land information, seems in many ways to embody the types of ideas, concepts, and recommendations outlined in your report. Because of LRMP, 76 of North

Carolina's 100 counties are now in the process of or have completed mapping their counties with modern cadastral maps. Thirty-one counties currently have Geographic Information Systems (GIS) and it is expected that within the next year 4 additional counties will acquire GIS capabilities. The program is also in the process of developing statewide standards for the local register of deeds offices in our state; when these standards are implemented, a wealth of land data at the parcel level will be collected, stored, and disseminated in a uniform manner.

We are very proud of the accomplishments and progress that our Land Records Management Program has made during its relatively short existence, and I would like to extend an invitation to the recommended National LIS Commission to visit the LRMP soon after it is established. Such a visit would allow the Commission to view a functioning program that is currently dealing with many of the same issues, problems, and goals which the Commission will confront.

Please contact our Department or me if we may be of help in your efforts to improve the handling land information.

Sincerely,

*Stephen G. Conrad*

Stephen G. Conrad

SGC:dph



MEMBER  
INTERNATIONAL ASSOCIATION  
OF ASSESSING OFFICERS

# ASSESSOR

P.O. BOX 471, 13TH AND PEARL  
BOULDER, COLORADO 80306  
(303) 441-3530



WILLIAM S. GOODYEAR, JR.  
ASSESSOR

September 22, 1989

John Moeller  
U.S Department of the Interior  
Bureau of Land Management  
Washington, D.C. 20240

Dear John,

I am replying to your review request dated July 14, 1989 concerning Land Information Systems (LIS) study. I recognize that you had a comment date through August 11, 1989. My assessment appeals workload did not allow me to meet your deadline. In the event that you have had some delay in your timelines, I am forwarding my comments on the draft LIS document.

Here in Boulder County, with the assistance of the Land Use Department, my assessors office is developing the ESRI Land Information System. We have been involved in the Land Information System development for about 6 years.

I found the documents that you produced very interesting especially the sections about education and standards for the Land Information System. I feel that establishing standards at this point will be very difficult due to the many changes occurring in the technology for computerized Land Information Systems. There is some danger in establishing standards in a rapidly changing technological environment. The danger might be that one would establish standards that would favor a particular vendor when the technology might change to later indicate that some other vendor or some other technology was more useful or appropriate.

The focus should be more on compatibility of standards and data information rather than on development of rigid standards. I would like to share that caution with you.

It is unlikely that there will be federal leadership and responsibility in the area of land information systems due to federal government cut backs on investment in these kinds of systems. The federal government certainly has the opportunity to provide leadership in land record systems. However, federal intervention without providing for financial assistance would be unwise. The people with the strongest motivation to automate land

record systems and produce usable land information systems (rather than theoretical map drawing systems) are people that are associated with individual parcel records management. These people include assessors and sometimes planners, who tend to operate with less parcel by parcel interest than assessors.

We could improve land information throughout the country with federal financial assistance in education and acquisition of land information systems on the local level. Land information is a local issue. People that are close to land, sales transactions and the daily filing of the deeds can provide the most insight and the best land information records if they have the proper training and tools. In addition to the good analysis of the information systems, your study would benefit from a discussion of system costs and funding sources.

If I could be of further assistance to you, please feel free to contact me.

Regards,

*Jai H. Ortega for William S. Goodyear*

William S. Goodyear  
Boulder County Assessor

WSC/jko



**Greenville County  
Planning Commission**

301 UNIVERSITY RIDGE / SUITE 400 / GREENVILLE, SOUTH CAROLINA 29601-3660 / (803) 240-7270

August 7, 1989

U. S. Department of Interior  
Bureau of Land Management (840)  
18th & C Street, N. W.  
Main Interior Building-Room 5622  
Washington, D. C. 20240

To Whom It May Concern:

The following information represents a summary of Greenville County's land information system as requested by your organization in reference to Section 8 of Public Law 100-409.

Greenville County's land information system consists of data collected and updated by various county departments and kept in files in the County's mainframe computer. Some of this information includes:


Property information as it relates to taxes - Tax Assessor Department.

Building Permit Information - Codes Department; and  
Land Use, Zoning - Planning Commission.

The tax map parcel is the unit of geography used in the land information system, although it can be related to census geography, election districts, special service districts, etc. However, as part of the 1982 South Carolina Tax Reappraisal program, a geodetic survey was conducted and the county has the capability to be included in the state of South Carolina's State Plane Coordinate System.

The county is presently investigating the purchase of a geographic information system. The City of Greenville currently has a geographic information system in place and is building a substantial data base.

Sincerely,

  
Thomas K. Meeks, AICP  
Director of Planning Services

cb

ALFRED C CRANE, JR. • 104 WINDER ROAD • TABB, VIRGINIA 23602  
(804) 867-8643

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th & C. Streets, N.W.  
Main Interior Building-Room 5622  
Washington, D.C. 20240

September 8, 1989

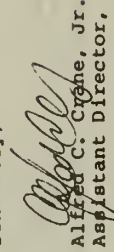
Attention: Pat Korp

I have reviewed the "Initial Draft" of the Land Information Study and found it to be an excellent document which establishes a cohesive approach to facilitate the interface and greatly improve the utility of Land Information Systems. I have discussed the report with local members of the Virginia Association of Surveyors and others with interest in this area, and their informal comments supported the effort.

Of particular interest to me was the educational area. I recently participated as the ASPRS representative in a study for the Commonwealth of Virginia which addressed applications of Remote Sensing. I was responsible for evaluating opportunities for instituting remote sensing opportunities identified in the study. I believe similar educational thrusts exist for LIS: first to train a professional group of LIS specialists with the skills and techniques that can be focused on key issues facing the country at all levels; and secondly develop a level of credibility and trust with users so that they will be able to use LIS as an endorsed and documented tool for their varied needs.

Thank you for the opportunity to participate in this review, and I look forward to future participation in this much needed effort.

Sincerely,

  
Alfred C. Crane, Jr.  
Assistant Director, Primary Data Acquisition Division ASPRS

cc: Nancy Parke  
Lee Bender

AUG 16 1989

U.S. Department of the Interior  
Bureau of Land Management (840)  
18th and C Sts N.W.  
Main Interior Building, Room 5622  
Attn: Pat Korp

2

Subject: Review of A Study of Land Information

Dear Ms. Korp:

Thank you for the opportunity to review your draft report in response to Public Law 100-409. The following comments are sent to you for your consideration.

General Comments

Public Law 100-409 Section 8 states in part that the mission of the study group is to study improvements in handling information. This report primarily describes issues relative to Land Information System Management. In the broadest sense, this is the same issue, but Section 8 could be interpreted to mean handling of data only and not the management of information derived from this data.

At a minimum, the issues of data exchange to include mutually agreed upon standards and the required cooperating mechanisms for data exchange, used to facilitate federal land exchange, should be explained in this study as well as how the creation of a national LIS commission with state and local government cooperating agencies will assure an orderly land exchange. This must be done to justify the vast expense of setting up this network under Public Law 100-409. If Public Law 100-409 won't allow this formation, additional legislation must be obtained.

In addition, this study should explain how the creation of a Land Information System multi-level government network will assure all parties will have accurate and timely land data including surveys and maps. In my review of this draft report, I used these criteria for evaluation purposes.

Specific Comments

1. In general the report is excellent and right-on-target.
2. The Departmental study focus guidance emphasized
  - a. Data collection and maintenance of land data
  - b. Land Information Systems at various levels of government
  - c. Improving surveying and mapping activities.
- a. Where are the proposals for improved collection and maintenance of land data? Standard p 54 states that "a network of land information systems should provide for maximum data exchangeability among the various components of the network", but there is no assurance of this without a plan to accomplish it.
- b. This issue is well studied and properly reported.

- c. Where are the proposals to improve surveying and mapping activities, beyond assuming that they will be better when combined together into one agency?
3. Public Law 100-409 recognized the need to develop a mechanism to assure all parties will have accurate and timely land data including surveys and maps. Where are these proposals beyond again as in 2(c) assuming that things will be better when the new LIS commission is formed.

Since you sent this request to me in Las Cruces, NM when I was a surveying professor and I remain a member of the Surveying Advisory Group at NMSU, I send you this response as a member of the advisory group and not as an employee of BLM SC-678

Best of Luck! It's a great report!

Sincerely,



Douglas J. Wilcox  
Adjunct Associate Professor CE and  
Member, Surveying Advisory Group  
NMSU





BLM LIBRARY  
SC-653, BLDG. 50  
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